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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information

of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

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FRIDAY, JANUARY 26, 1906.

The beginning of a system of instruction for shop apprentices designed to enable them to gain an elementary knowledge of the technical part of their trade was recently made by the Southern Pacific at its Sparks, Nev., shops. The work was started by giving instruction in mechanical drawing to the apprentices, and a small building was put up for this special purpose. Arrangements were made with the president of the State university to have the Associate Professor of Mechanical Engineering, Mr. J. G. Scrugham, devote two evenings a week to the instruction of the boys. Although the work has been in progress only a short time, the results are regarded as being sufficiently encouraging to justify considering its extension to the Ogden and Pocatello shops; also of adding to the course some instruction by the electrical engineer. A good deal has been written and said of late regarding the benefits to accrue both to apprentices and to the company from suitable instruction of this sort, in the production of well-trained, educated workmen, among whom will undoubtedly be found material from which foremen can be selected, and which in turn will supply material for higher positions. It is therefore of interest to know what degree of appreciation the Southern Pacific apprentices are manifesting toward this instruction and the opportunities afforded thereby. It appears that perhaps 50 per cent. of them are taking great interest in the work and are turning out mechanical drawings that are said to average up better than freshman class work in the technical schools. Among the remaining 50 per cent. there are some that apparently are entirely without interest in the work—a condition to be expected, since in any given number of students selected at random it would be exceptional not to find some who slight their opportunities. Quite likely, in the present instance these latter are unsuited to the trade they have set out to learn, and would be better off in some other kind of work. While there are always some men in the ranks who, through native ability and ambition, will rise in one way or another, it is said by men in position to know that the majority of mechanics nowadays are not ambitious for promotion, because of a seeming lack of confidence in their ability to assume executive duties or other responsibilities. But education develops latent talents and creates confidence; the apprentices are started thinking on their

own account, broadening their ideas and in time their usefulness. In such results the railroad company will be repaid many times over for its outlay in providing a course of training.

INSULATION OF POLE-LINE SIGNAL WIRES.

A number of protracted discussions in the Railway Signal Association concerning the insulation of aerial electric signal wires have resulted in little or no definite advance in knowledge; and the last one, at the meeting in New York City, January 9, differed materially from the earlier ones only in making the defects in the wire service a little plainer than they were before. It may be useful to briefly restate the case.

Considering automatic signals only, line wires on poles are used for:

- (1) Control of indicators or switches by signals or by track relays.
- (2) Control of signals by switches.
- (3) Control of distant signal from tower or from home signal.
- (4) To supplement the track circuit, as when a relay is placed at the end of the track circuit farthest from the signal; that is to say, at the battery end.
- (5) In single track working, to control a signal at one end of the block section or signals remote from the track section.

The importance of the wire question may be appreciated when it is considered that a single railroad company has several thousand miles of signal wires on poles.

All of the uses mentioned would have been called necessary uses up to a few years ago, when the polarized relay was introduced and the "wireless" system began to find favor. Except on single-track lines, the introduction of the polarized relay made it possible, under favorable circumstances, to control all signals and switches by means of the track circuit. The most necessary function, that of throwing a distant signal to the clear position immediately after the corresponding home signal clears, is readily accomplished by changing the polarity of the track circuit which extends between the home and the distant signal. This is done by causing the home signal, when it completes its stroke to the clear position, to

move a pole changer for the battery of the track circuit in question. Indicators and switches can, by well-known means, be managed even more easily than the distant signal.

But not every signal engineer has adopted the wireless system, and not all of those who have adopted it claim for it the highest perfection; and the question of the adaptability and sufficiency and economy of line wires still remains an important one. One road which has introduced line-wire adjuncts and safeguards quite extensively, claims that by reason of the stray earth currents in the ground throughout considerable portions of its lines, the use of the track circuit alone for the control of automatic block signals is unreliable and even dangerous. Whether these stray currents are caused by terrestrial magnetism which is uncontrollable, or come from electric railroad or light circuits, which might perhaps be controlled, or at least be recognized and intelligently dealt with, may be considered as not affecting the present inquiry. If the weak currents used to work signals through rails are forever to be susceptible to disturbance by foreign currents, the mere possibility of such disturbance is a sufficient reason for taking all practicable precautions against it. New sources of disturbance, expected or unexpected, may arise at any time. Other roads have borne similar testimony to difficulties with track currents, though but very few companies have had such extensive and varied experience as the one mentioned. Several roads which have made much use of the wireless system have found at least a few places on their lines, where it has been decided to be necessary to use line wires for all purposes for which the line wires are adapted, and not to put full dependence for everything on the track circuit alone.

Wires being necessary, there are two questions to be settled: First, is it necessary to insulate them, and, second, if insulated, can the insulation be made reasonably durable? In other words, what is the annual cost of insulated wire for a long term of years?

The chief danger to be apprehended with line wires is the danger of crosses. With automatic block signals, the first essential is safety. Line wires are so connected to the instruments that a failure in any part will turn the signal to the stop position, a safe position. But a cross is a failure which no one has yet successfully provided against. A cross with a telegraph wire may divert current from that into the signal wire and wrongfully turn the signal from the stop to the clear position; and thus lead a train to destruction. A cross between two signal wires might do the same thing, if it connected the batteries in the right way. Theoretically, bare wires may be made safe. With poles set near enough together, and wire, insulators, cross arms and bolts of ample strength a pole-line might be made to defy the storms with almost ideal certainty; and decay of poles would be the chief danger to be guarded against. But is it not cheaper to envelop each wire in an insulating coat and thus use fewer poles and less expensive wires? This is a question which ought to be decided on accurate data, for each situation, and one on which the world is waiting for signal engineers to give their experience in lucid figures; so that it will not be necessary for the representative of a prominent road to say—as one said at the last meeting of the Railway Signal Association—that he believes insulation necessary, but does not know exactly what he wants.

The immediate difficulty most talked about by the signalmen at that meeting was poor insulation. "Weather-proof," as applied to the wrapping of a wire, may be interpreted as meaning not proof against any destructive agencies worse than the weather; nothing that is more severe than rain, hail, snow, sleet, frost and solar heat. In so far as an insulating braid is not proof against abrasion it is not even weather-proof, for wind, which is an element of weather, may quickly wear off a considerable thickness of the braid on a wire by swinging the wire against a tree or post. There was much complaint that the compounds used to saturate the braid on wires became disintegrated very quickly and dried out. But, as the manufacturers at once asserted, that trouble was probably due to scrimping prices. Good weather-proof wire can be had by paying for it. But how well do we know the value of good insulation? None of it is claimed to be as durable as the copper which it encloses; what, therefore, is to be done when the braid becomes unserviceable by age, while the copper remains sound? Can copper be taken down, rebraided and put up again? If not, it must, when taken down, be sold as scrap. If, as was once or twice suggested, the copper, after the loss of its coat, is to be used for an indefinite further time as bare wire, the whole argument for insulation fails, for if it is safe to use bare wire to-day the money spent for insulation last year was wasted.

From present practice and opinions, therefore, it would appear

that we must close, as we began, by asking: Do we want insulation? Do we want it all the time? How much does it cost? And in how many instances have dangerous conditions been caused by lack of, or by defects in, insulation?

THE ESSENTIALS IN RATE REGULATION.

A National Congress of Boards of Trade, which takes as its name "The National Board of Trade," is now in session at Washington, and has passed the following resolutions with regard to rate regulation:

The National Board of Trade, believing that the interests of the people demand not only that the rates of transportation should be reasonable, and that there shall be no unjust discrimination or preferences, but also that there shall be effective governmental supervision of all interstate transportation agencies, expresses the earnest hope that Congress will, in its wisdom, and as speedily as possible, enact such further legislation as may be necessary, with justice to all concerned, to secure prompt and complete correction of any abuses in transportation methods or operations which may, upon due inquiry, be found to exist, and, to that end, that rebates and personal discriminations, in whatever form they may occur, and by whatever device they may be accomplished, be prohibited; that the corporations and individuals who in any manner participate in them be subjected to severe penalties, and the most effective machinery practicable be provided for their detection and punishment; also believing that the Government should, in the interest of the general public, including the purchasers of transportation as well as the carriers, possess means to prevent the naming of excessive rates in the schedules, it is recommended that whenever a United States court of competent jurisdiction, upon complaint of the Interstate Commerce Commission (which complaint shall be given precedence), shall have determined that an existing rate is excessive, the commission, or some other competent authority, be given power to compel the substitution of a reasonable maximum rate, such rate to go into effect within a reasonable time and to remain in force for such period, not longer than one year, as may be determined, the rate fixed to be subject to revision in the proper Federal Court upon proof that such rate is less than reasonable compensation.

Perhaps this action shows as well as any single fact which has been recorded the remarkable way in which the people of this country have been educated with regard to the whole subject of railroad rates and rate-making and discriminations. Last year the National Board adopted a resolution, in common with many similar organizations, which was in line with the unworkable and undesirable provisions of the Esch-Townsend bill. This year their recommendations are clearly thought out; they aim their measure solely at rebates and discrimination, and they suggest as a remedy a maximum rate, to remain in force for a period not longer than a year, subject to revision in a Federal court upon proof that the rate is less than reasonable compensation. This seems as fair a remedy as any that has yet been promulgated; yet we must again point out, as we have often pointed out before, that a tremendous responsibility in any such case rests with the commission, and that the importance cannot be overestimated of having a commission composed of men sufficiently intelligent to give decisions which will not paralyze industry prior to their reversal by the courts. Granting that some effective way must be found of stopping discrimination, it is obvious that the principal things to be done are two in number. First of all, a board of men must be found—and this is a matter of the gravest difficulty—who can make decisions carrying as intelligent an understanding of traffic situations as those made by railroad officers; second, a law must be formulated which will not permit a stupid or excited commission to do injuries which would be all but irreparable. All who have studied the present situation must be more and more impressed by the fact that most, if not all the difficulties of the present situation, are due to a single element—the law's delay. It is probable that few of the best informed critics of American railroad conditions would deny that the present laws are adequate, if the small shipper who has suffered a real wrong could get a hearing and obtain his remedy in a short time and at small cost; but it is useless to ignore the lamentable fact that where decisions drag through a period of time averaging about four years in important cases, as was brought out in the testimony last spring, the small shipper has at present no remedy.

Much has been said, both before the Senate Committee and in the public press, about the interdependence of railroad rates and the fact that there is scarcely a rate in the country that really stands alone, and that can be changed without affecting a good many other rates as well. It seems scarcely necessary to proceed into a discussion of this question, but several concrete instances are at hand which we quote to add force to the points which we consider crucial in making any rate regulation law, as enumerated above; the requirements that the proposed remedy shall never afford a means of paralyzing industry and that it is absolutely and

vitaly essential that the right men administer the remedy. These specific instances, selected to illustrate the way in which the change of the rate on a particular classification, or on a particular commodity, between two points may force a change in the rates on that classification, or on that commodity, between other points, and may frequently affect an extended territory, are as follows:

INTERDEPENDENCE OF RAILROAD RATES.

On February 1, 1905, important reductions were made in the class and commodity rates from Louisville to Atlanta. Simultaneously, similar reductions were made from Cincinnati, Ohio; Evansville, Ind.; Cairo, Ill.; Memphis, Tenn., and New Orleans, La., to Atlanta. These reductions from the western markets forced corresponding reductions in the rates from Baltimore, Philadelphia, New York and Boston. The reductions from the Ohio river crossings were followed by reductions from points north of the Ohio river, and the reductions from the eastern ports necessitated reductions from interior eastern markets competing with the seaboard cities. The reductions to Atlanta necessitated reductions to points competing with Atlanta, such as Macon, Augusta, Columbus, Rome and Chattanooga. The reductions from Louisville to Atlanta brought about reductions from Chattanooga and Birmingham to Atlanta. The reductions from the eastern seaboard cities to Atlanta necessitated reductions from the southern ports to Atlanta. By this process of relative rate adjustment between markets, the initial changes referred to above from Louisville and Baltimore to Atlanta, extended to the traffic moving from the northwestern and New England States to practically every city and town in the State of Georgia, and, in their final operation, reduced the rates on a large number of classes and commodities from Atlanta to Macon; two cities in the State of Georgia less than ninety miles apart. The rates on cotton from Atlanta, Ga., are at present as follows:

	Per 100 lbs.
To Jacksonville, Fla.	43 cents.
" Brunswick, Ga.	43 "
" Savannah, Ga.	43 "
" Charleston, S. C.	43 "
" Wilmington, N. C.	43 "
" Norfolk, Va.	49 "
" Mobile, Ala.	48 "
" New Orleans, La.	53 "

For many years past the slightest reduction in the rate from Atlanta to either of these ports has been followed simultaneously by corresponding changes to all the others. The distance from Atlanta to Wilmington, N. C., is 435 miles, and from Atlanta to Brunswick, Ga., 279 miles, but on account of the competition of the carriers serving these markets, respectively, the same rate applies to both ports. In 1897, by action of the Georgia Railroad Commission, the rate on fertilizers from Brunswick, Ga., to Atlanta, Ga., was reduced from \$3.14 to \$2.57 per ton of 2,000 pounds. The carriers serving the markets of Savannah, Ga., and Charleston, S. C., immediately made the rate from those points the same as from Brunswick.

These instances show how the change in a rate on a certain commodity extends over a much larger area than would be at first apparent. The instances which follow carry the same idea further and show how the change in a rate on a particular commodity may force readjustments in the rates on other correlated or competing commodities:

Until a comparatively recent date there has been no competition in the southeastern section of the United States between vegetable oils and hog lard, but the development of the cotton seed industry resulted in the production of a large amount of cotton seed oil which has become a sharp competitor for the trade formerly enjoyed by hog lard, the refined cotton seed oil being sold in its native state and after conversion into so-called compound lard. When this competition arose, the railroads in the southeast provided for it by classifying cooking oil the same as lard, and by making the commodity ratings the same on both articles.

The rate on pig iron from Birmingham, Ala., to Cincinnati, Ohio, is \$2.75 per ton of 2,240 pounds. This adjustment is the result of efforts on the part of the southern lines to develop the manufacture of iron pipe in southern territory, in competition with the pipe foundries in Pennsylvania. This is only one of many instances of the same character.

Generally, the rates on fertilizers are the same as the rates on fertilizer material, used in the manufacture of fertilizers, such as kainit, nitrate of soda, muriate of potash, blood and tankage, acid phosphate, tobacco stems, fish scrap, cotton seed meal, etc. The values of these commodities vary very greatly, but cotton seed meal, kainit and acid phosphate are sold in competition with the complete commercial fertilizer, generally known

as ammoniated goods, and this competition has forced uniform rates upon the ingredients and the manufactured goods. Until about four years ago the rates on wheat and corn from the western markets to points in the southeast were slightly lower than the rates on flour and meal to the same points, but the lines originating this business at the Ohio river forced a reduction in the rates on flour and meal to the grain basis, presumably in the interest of the western miller, who formerly paid a higher rate on the manufactured product to points in the south, where mills were situated, than the southern millers paid on the raw material.

The rate on cotton, in bales, by rail and water routes from Columbus, Ga., to Boston, Mass., is 66½ cents per 100 lbs., out of which the carriers pay a compress fee of 7½ cents, leaving a net rate of 59 cents. The rate on cotton factory products between the same points, via the same routes, is only 55 cents per 100 lbs. This comparatively low rate on the manufactured goods grew out of the efforts of the railroads in the south to develop the cotton milling industry on their lines, in competition with the established cotton milling districts in New England.

CAST-STEEL.

The first steel castings made in this country of which anything is generally known, were crossing frogs made for the Philadelphia & Reading in July, 1867, by the William Butcher Steel Works, now the Midvale Steel Co. These castings were made from crucible steel of about the same hardness as tool steel, and while they had a smooth surface they were honeycombed throughout and far from perfect. Neither the Bessemer nor the open-hearth process of steel making was in successful use at that time. It was not until after the perfection of the open-hearth process, the Tropenas and other improved Bessemer processes 15 or 20 years later that cast-steel began to be used as a commercial material of construction, although the early experiments with crucible steel resulted in the discovery of several important principles of foundry practice, notably a suitable moulding mixture and the use of manganese and silicon for producing sound castings. Within the last ten years the art of making steel castings of high tensile strength and ductility has reached the point where almost any shape which can be cast in gray or malleable iron can be made in cast steel. Large marine castings, stern posts, bed plates, hawse pipes and the like are now almost universally made of cast steel and smaller parts are made with an equally high percentage of perfect castings.

In car and locomotive work, cast-steel is taking the place of cast, malleable and wrought iron for many large and small parts. Couplers, draft sills, body bolsters, platform sills, truck bolsters, truck frames, journal boxes and even wheels are now being made of this comparatively new material. Locomotive frames, wheel centers, cross-heads, axle boxes, rods and other parts are being made in large numbers, and have given good results in service. The greatest difficulty in making such castings of steel is the proper design of the piece, for with cast-steel the shrinkage, tendency to honeycomb, and washing out of cores and small projections in the mold require a different foundry practice from that used in making gray iron castings. Sharp corners and thin ribs or webs must be avoided and proper provision made for risers and gates in the mold. Molten steel, if not hot enough, is sluggish, and if too hot is violently agitated by the gases formed in the mold. It has more of a tendency to wash off small projections in filling a mold unless carefully poured and in shrinking it contracts more than cast-iron, and in a less uniform manner. Blow-holes can be largely prevented by the mixture of manganese and silicon with the steel and perfect venting of the mold, but too high a proportion of these elements results in brittleness. Green sand molding is now used almost entirely instead of the dry baked molds formerly employed, and with equally good, if not better, results. For duplicate work, such as coupler bodies and parts, molding machines are as well adapted for making steel castings as for gray and malleable iron castings.

The manufacture of couplers and bolsters from cast-steel has reached a stage of development beyond which little more could be asked. Where weaknesses have developed, slight changes in the pattern or in the method of molding and location of gates, risers and sinking heads for feeding the casting in cooling have usually overcome the difficulty and the standard makes of these parts of car equipment are turned out with a remarkably low percentage of defects. More complicated shapes, however, like locomotive frames are often difficult to make perfectly, even though they have been designed as nearly as possible in accordance with the best practice in similar parts. The segregation and shrinkage sometimes cannot

be determined until a few trials have been made with the patterns.

A committee of the Master Mechanics' Association in 1904 reported the preference of members in favor of cast-steel locomotive frames based on the number of locomotives in use as more than double the number in favor of hammered iron frames. Specifications for cast-steel frames were reported as follows:

Acid open-hearth steel; 0.28 carbon, 0.05 phosphorus, 0.05 sulphur, 0.60 manganese; tensile strength not less than 55,000 lbs. per sq. in.; elongation in 2 in. not less than 15 per cent.; all frames to be annealed.

These specifications are well within the resources of the steel founder. A recent bridge specification requires acid open-hearth steel; sulphur, 0.05; phosphorus, 0.05; manganese, 0.80; silicon, 0.35; ultimate strength, 65,000 lbs.; elongation, 20 per cent. in 2 in. The importance of careful foundry practice is emphasized in the committee's report, and also adequate annealing, which is an essential element of the process. Unannealed or poorly annealed steel castings are unreliable and weak.

The comparative strength and ductility of cast-steel is shown by the following table, compiled from tests made in 1891 by a committee of the Master Car Builders' Association:

Material.	Ult. strength.	Comparative strength, c. l. = 1.	Elongation in 4 in., per cent.	Comparative ductility, malleable iron = 1.
Cast iron	20,000 lbs.	1.0	0.35	0.17
Malleable iron	32,000 "	1.6	2.00	1.0
Wrought iron	50,000 "	2.5	20.00	10.0
Cast steel	60,000 "	3.0	10.00	5.0

The saving in weight for equal strength is about in proportion to the ultimate strength, and because of its high ductility cast-steel

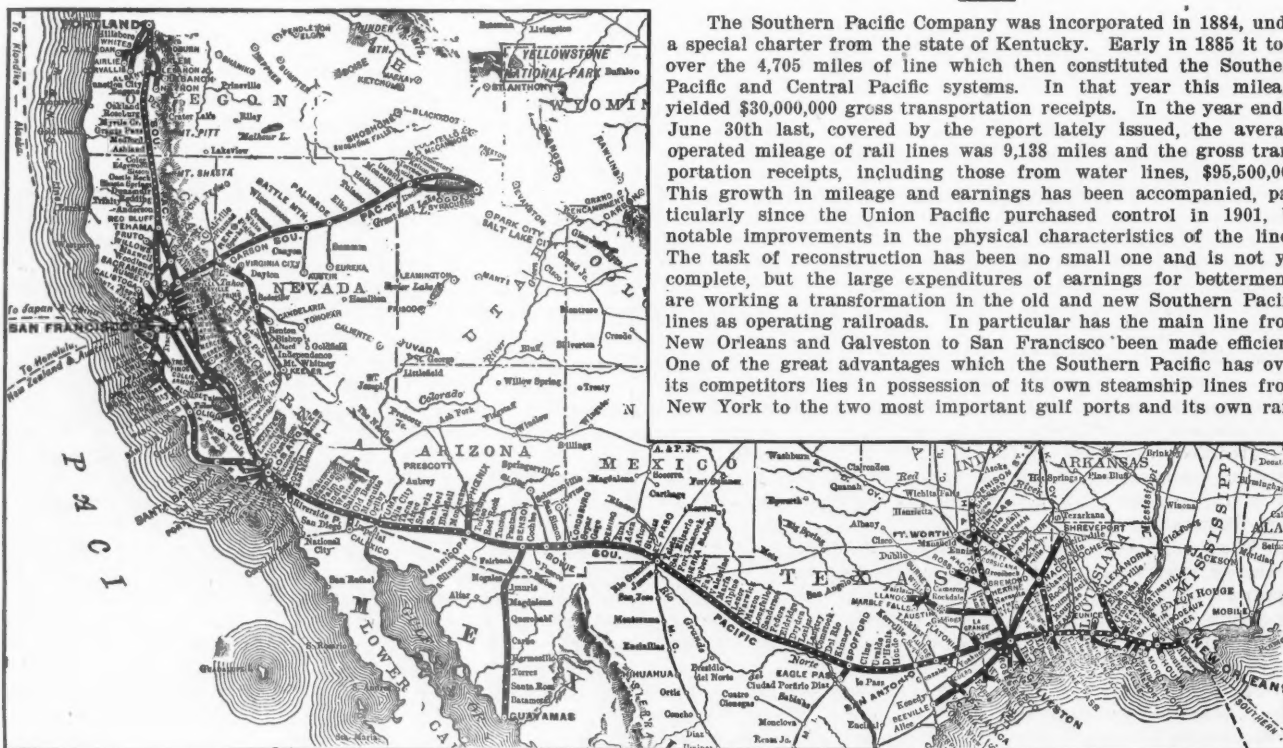
The reader needs not to be told that the brevity of this list has no great significance as affecting the aggregate loss of life and property by train accidents in the month of December, for a glance at the items under the different dates will show that it is only in what may be called big disasters that December presents a less discreditable record than its immediate predecessors. The Government record, when it appears, may very likely show totals even larger than the average—so little does a half dozen wrecks of the \$100,000 grade affect the grand total for the 220,000 miles of road on which accidents occur.

The Rock Springs collision is in no way exceptional, so far as the cause is concerned; but a circumstance which is quite exceptional is the killing of so many persons on a passenger train while yet no passenger is killed. High-class long-distance passenger trains now approach the ocean steamship in the variety of services performed for passengers, and consequently in the number of employees carried on the train. The New York City collision is notable, first, by the question of signaling connected with it—and the failure of the state railroad commissioners to get any useful information concerning the culpability of the engineman or others concerned—and second because of its suggestions. It occurred on a line soon to be electrified, and the overturned car was one which would undoubtedly be quickly set afire by the short circuiting of a powerful electric current on or near the track beneath it.

The number of electric-car accidents reported in the newspapers as occurring in the United States in December was 19, in which five persons were killed and 87 were injured.

Southern Pacific.

The Southern Pacific Company was incorporated in 1884, under a special charter from the state of Kentucky. Early in 1885 it took over the 4,705 miles of line which then constituted the Southern Pacific and Central Pacific systems. In that year this mileage yielded \$30,000,000 gross transportation receipts. In the year ended June 30th last, covered by the report lately issued, the average operated mileage of rail lines was 9,138 miles and the gross transportation receipts, including those from water lines, \$95,500,000. This growth in mileage and earnings has been accompanied, particularly since the Union Pacific purchased control in 1901, by notable improvements in the physical characteristics of the lines. The task of reconstruction has been no small one and is not yet complete, but the large expenditures of earnings for betterments are working a transformation in the old and new Southern Pacific lines as operating railroads. In particular has the main line from New Orleans and Galveston to San Francisco been made efficient. One of the great advantages which the Southern Pacific has over its competitors lies in possession of its own steamship lines from New York to the two most important gulf ports and its own rails



Southern Pacific.

can be used in places where cast-iron cannot be used on account of the low resistance to shock, as in couplers and bolsters. Large heavy malleable castings cannot be made with strength in proportion to the weight, but with properly annealed steel castings the strength varies almost directly as the area of cross-section. The possibilities of this material have by no means been exhausted in car and locomotive work.

December Accidents.

The condensed record of the principal train accidents which occurred in the United States in the month of December, printed in another column, contains accounts of 29 collisions, 25 derailments, and five other accidents. Those which were most serious, or which are of special interest by reason of their causes or attending circumstances, occurred as follows:

Dec.	Place.	Killed.	Injured.
7th	Rock Springs, N. Y.	9	19
19th	New York, N. Y.	1	15
22d	Holly Springs, Miss.	1	8

from them to the most important Pacific port. Thus, except on perishable freight, it can get the whole haul and the whole rate across the continent.

Gross railroad earnings for the year were \$89,403,632, an increase of \$2,493,126 over 1904. Operating expenses increased only \$243,874, leaving net earnings of \$30,873,617, an increase of \$2,249,253 over the previous year. The gross earnings came \$57,759,312 from freight and \$26,412,631 from passenger and extra baggage earnings. Passenger earnings increased \$1,200,000, or nearly 5 per cent., and freight earnings \$1,160,000, or 2 per cent.

Operating expenses show a fine record of increase in the maintenance charges and decrease in conducting transportation account. Maintenance of way increased \$1,416,239, or 11.5 per cent., and maintenance of equipment \$939,651, or 7.8 per cent. The decrease in conducting transportation was \$2,315,331, or 7.2 per cent. General expenses at the same time increased 10.6 per cent. Increases in maintenance of way account came in those items which most closely reflect betterment of the line. Repairs of roadway increased \$742,000; renewals of rails, ties, and other track material, \$355,800, and repairs of buildings, docks and wharves, \$196,500. Per

mile of main and second track, maintenance of way expenditures were \$1,476 against \$1,341 in 1904. Maintenance of equipment account includes \$143,377 written off against 29 old locomotives; \$92,261 for changing 176 locomotives to burn oil, and \$45,613 for changing 19 locomotives from compound to simple; also, \$37,893 for metal cabs put on 77 locomotives, for equipping 406 locomotives with acetylene headlights, and for 174 steel-tired wheels used in renewals. The same account also includes \$102,300, cost of replacing 28 passenger cars disposed of, and \$562,053, cost of replacing 1,556 freight cars also sold, destroyed or condemned, including the cost of equipping 45 narrow gage cars with air-brakes and 347 narrow gage cars with automatic couplers. The average cost of repairs per locomotive and per car was \$3,473 per locomotive in 1905 against \$3,588 per locomotive in 1904; \$920 per passenger car in 1905 against \$823 in 1904, and \$85 per freight car against \$81 in 1904. Of the four unit items of maintenance charges, every one, with the exception of cost of maintenance per locomotive, which was larger in 1904, is heavier than in any previous year. The decrease of \$2,315,331 in conducting transportation was most of all due to a decrease of \$1,665,649 in cost of fuel; wages of engine-men and trainmen decreased \$235,688. The company was also much more fortunate than in the previous year in the amount of payments necessary for injuries, loss and damage, in which item there was a decrease of \$433,100, or 21.5 per cent.

There was an increase of 23,348,638, or 1.87 per cent., in the number of passenger miles, and a decrease of 1,298,829, or 0.02 per cent., in the number of ton-miles. Excluding ferry and suburban passengers, the average receipts per passenger mile were 2.183 cents against 2.141 cents in 1904. The ton-mile receipts also show a small increase, from 1.014 cents in 1904 to 1.046 cents in 1905. The average passenger traveled 84.39 miles against 82.83 miles in 1904. The average distance a ton of freight was carried was 268 miles against 277 miles the previous year, a decrease of nine miles, or 3.2 per cent. The average number of passengers per train increased from 63 to 65, or 3.4 per cent. There were 18.96 tons on the average in each loaded car, a slight decrease from the preceding year. The train load, on the other hand, increased from 275 tons to 290 tons, an increase of 15 tons, or 5.4 per cent. Largely through the working of the equipment clearing house, described in detail in the *Railroad Gazette* of January 19th, there was a gain of 2.95 per cent. in the percentage of loaded freight car mileage to total freight car mileage, and a decrease of 11.4 per cent., or 18,188,813, in the number of empty freight car miles. This corresponds roughly to the running of 433,000 freight train miles.

All these figures show increased operating efficiency and large expenditures for the up-keep of the property. The company's record is, in fact, to all but one class of persons, exceedingly satisfactory. These are the holders of that part of its \$197,849,000 common stock over and above the \$90,000,000 through which the Union Pacific holds control. The surplus after charges a year ago amounted to 4½ per cent. on the capital stock. This was all put back into the property. Since that time, \$40,000,000 7 per cent. preferred stock has been issued. Allowing for the \$2,800,000 charges thus placed ahead of the common stock, the surplus for 1905 equals 4.96 per cent. on the common. In view of these surpluses, and the strengthening, through refunding during the year, of the company's financial position, many of the common stockholders believe that a dividend is clearly due them. No dividend has ever been declared on the common stock, but just at the time when the long record of expenditures out of earnings on the up-building of the property seemed about to result in such increased efficiency of operation that dividends could consistently be declared, a new factor has come up, which, judging from a statement made in the report, will delay for some time longer any such distribution. This is the necessity of building new lines of railroad for two purposes: To develop local areas tributary to the existing lines and to offset the aggressive building of competitive lines. At least 400 miles of new line, including an extension eastwardly from the San Francisco-Portland line into central Oregon, have already been authorized, at an estimated cost of about \$14,000,000. In addition, the Mexican Government has granted a concession for building 775 miles of line on the west coast of Mexico from Guaymas, the present terminus of the Sonora Railway, to Guadalajara. In order to take advantage of opportunities which in most cases must be seized at once, the management announces that in its judgment the resources of the company must be held in reserve and carefully husbanded.

Thus, disappointment still seems to await those who have been hoping for dividends. Patience may in this case appear to be a difficult virtue to exhibit, but eventually holders of the common stock must get the advantages of this broadening of influence. With the first class main lines which have been wrought out of the properties taken over in 1885, and the strategic importance which the new extensions will give the company, the time must sooner or later come when the Southern Pacific will be in profits to its stockholders, as well as territorially, one of the most important of the country's railroads.

The following are the principal statistics of operation of the rail lines:

	1905.	1904.
Mileage worked	9,138	9,014
Freight earnings	\$57,759,312	\$56,602,651
Passenger earnings	26,412,631	25,201,488
Gross earnings	89,403,632	86,910,406
Maint. way and structures	13,731,801	12,315,562
Maint. of equipment	12,989,732	12,050,081
Conducting transportation	29,691,601	32,006,932
Operating expenses	58,530,015	58,286,141
Net earnings	30,873,617	28,624,365
Gross income*	98,140,582	95,522,992
Net income*	13,124,416	9,593,215

*Including water lines.

NEW PUBLICATIONS.

Biographical Directory of the Railway Officials of America. Edition of 1906. Cloth. 694 pages, 6x8½ ins. Price, \$3.00. Railway Age Company, Chicago.

Following the five preceding volumes, the earliest issued in 1885, this latest edition of the *Directory of Railway Officials* brings down as nearly as possible to date the record of service of most of the principal railroad officers of the United States, Canada and Mexico. It is a collection of brief personal histories of the men now, or formerly, occupying important railroad positions, giving, in general, in each case, the date and place of birth, institution where educated, and, so far as possible, a continuous record of positions held since first entering railroad service. The present volume contains such a brief biographical record of 5,000 different men. Included in the list are the names of many men who have left important positions in railroad service to engage in other business, but whose railroad records are of general interest. Also, in recognition of the increasing influence of government in railroad management, there are included sketches of the personal history of 96 national and state railroad commissioners. Many of the individual records are exceedingly interesting as showing the steps in the career of some of the country's most successful men. The chief value of the book is, of course, as a reference volume for railroad libraries.

TRADE CATALOGUES.

In 1894, the Master Car Builders' Association, for convenience in the filing and preservation of pamphlets, catalogues, specifications, etc., adopted a number of standard sizes. The advantages of conforming to these sizes have been recognized, not only by railroad men, but outside of railroad circles, and many engineers make a practice of immediately consigning to the waste basket all catalogues that do not come within a very narrow margin of these standard sizes. They are given here in order that the size of the publications of this kind, which are noticed under this head, may be compared with the standards, and it may be known whether they conform thereto.

	Standards.
Postal-card circulars	3½ in. by 6½ in.
Pamphlets and trade catalogues	3½ " by 6 "
	6 " by 9 "
	9 " by 12 "
Specifications and letter paper	8½ " by 10½ "

Foundations and Setting Machine Tools.—This is the title of a neat little booklet published by the Niles-Bement-Pond Company, New York. It contains valuable information for those who have to do with the building of foundations and the setting of machine tools. Brick foundations are referred to in a brief way, but concrete foundations are recommended unless there is some good special reason for using brick.

Steam Shovel News.—No. 1 of Vol. 2 of this interesting little magazine contains an announcement that hereafter it will appear monthly. The current number has as its leading article, "A Competitor of the Panama Canal." There is also an illustrated description of an interesting sewer and ditching job, and other short articles and notes of interest in this line.

Hammers.—Illustrations and price lists of all kinds and sizes of hammers forged from solid-crucible cast-steel are given in a catalogue published by The David Maydole Co., Norwich, N. Y.

Incandescent Lamps.—A handsomely illustrated catalogue descriptive of the Sawyer-Man incandescent lamps is being distributed by the Westinghouse Electric & Mfg. Co.

CONTRIBUTIONS

Shipping Subsidies.

New York, Jan. 22, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your excerpts from Mr. Royal Meeker's article contributed to the *Political Science Quarterly* for December, "Shipping Subsidies," contain one or two statements inviting examination. Comparing certain questions and answers in the report of a Parliamentary Committee on Packets and Telegraphs—Blue Book VI., 1859—with

Mr. Meeker's: "From 1847 to 1858 the government paid nearly \$15,000,000 in mail subsidies to six different lines. The subsidies failed to give any permanent impetus to steam navigation." We find Mr. Cobden asked Q. 588: "You are aware that it (the Collins line) ceased because the American Government withdrew the subsidy?" And Mr. Wilson followed: Q. 613. "The Cunard's contract is £191,000 is it not?" A. "Yes, £191,400."

Q. 617. "Three hundred and twenty thousand pounds is the amount which is now paid by this country and the colony for the transmission of postage, including the Galway line?" A. "Yes."

Q. 618. "And in the face of these increasing subsidies the American Government have altogether relinquished the practice of subsidizing their vessels; and their vessels, of course, have been driven off the passage."

No one, I think, can read the above without conviction that Mr. Meeker was not fully seized of the subject of which he was writing. In fact, the value of subsidies to British shipping and British commerce is very generally underrated by our advocates of subsidies. In 1846, see reports of committees, XV., p. 30, Cunard testified: "If I had got this contract (for a line to New York in addition to his line to Boston) three months sooner there would have been no American line." A statement which leads us to infer that it took cash in hand to secure legislation adverse to American

in British shipbuilding has been concurrent with American ululations over the depressed state of maritime interests. And you will remember that during a large part of the first calendar year in which our exports of iron and steel products exceeded our imports our best statisticians and publicists were proving that such an excess was impossible.

EDWARD P. NORTH.

Loading Equipment for Panama.

New York, Jan. 24, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

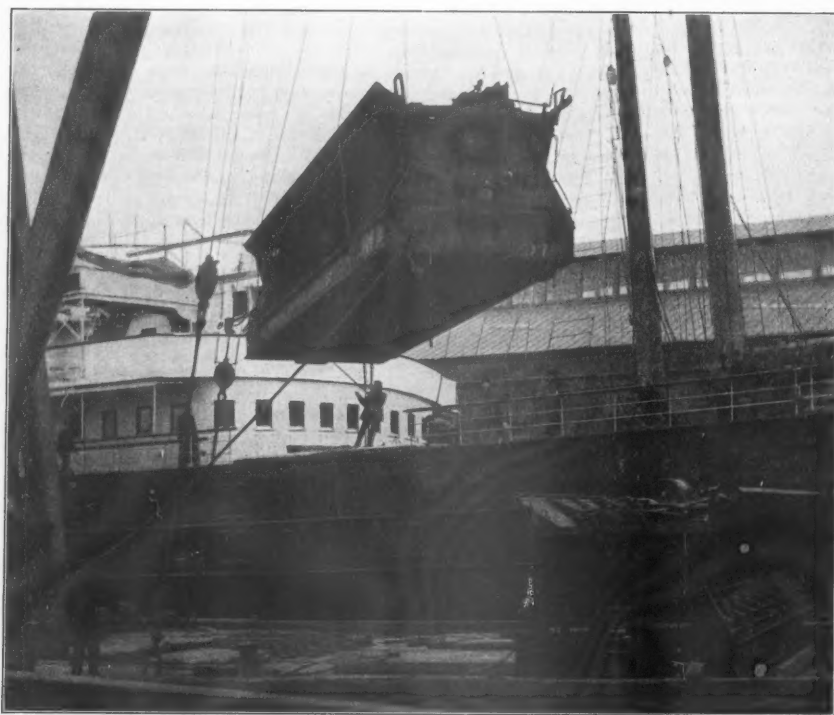
Where a gigantic enterprise, like the Isthmian canal, is undertaken, and after years of unsuccessful effort, there finally results failure, both financially and from an engineering standpoint, then in order to make a new beginning there necessarily is much that must be undone, and there are many created obstacles that must be removed before the real work can properly be started. From those who express their opinions before they have formed them, we expect criticism and impatience, without an attempt at practical suggestions for the solution of the problem. The actual labor to be performed, simply to get ready to do the work in the right way, is necessarily enormous, and it would be surprising if there were not a few individuals to be found who did not understand the conditions and who therefore should feel called upon to severely criticize.

In order to appreciate in a measure the nature of the obstacles to be overcome in even the preparatory measures, it is only necessary to follow a few of the details of securing adequate equipment for the proper carrying out of the plans. It is comparatively an easy matter for a committee to settle upon the proper equipment; but few persons understand the difficulties to be overcome in securing, shipping and setting up the necessary ponderous equipment in a new country where but few of the implements required for the proper handling of this equipment are available at the outset when they are most needed. The large cranes, the Bucyrus pile-drivers, hoisting machines and cars already shipped on the Panama steamers are in themselves more ponderous and difficult to secure and place in their proper locations than the subsequent material to be handled. The reason the first attempted cutting of this Panama Canal failed was that adequate preparation was never made to begin the work in the proper manner. The present Isthmian Canal Commission has begun in the only possible way to assure successful progress and achievement.

In the speech recently made by the Hon. Theodore P. Shonts before the Commercial Club, in Cincinnati, he said: "Preparation is a part, and a most important part, of the work of construction." This stupendous work cannot be achieved without adequate equipment of the most approved and thoroughly tested designs, and I believe all practical engineers will agree with Mr. Shonts in his views as put forward in this speech and see the necessity of doing just what he says is being done. He says:

"We are approaching the end of the preliminary work. We have made the Isthmus a healthful place in which to work. We are getting the line of the canal into a condition which will enable us to operate an excavating plant to the best advantage, and we are assembling the plant with which the work is to be done."

He further explains that although most of this equipment had to be manufactured to order the bulk of it is now on the ground. Just how much labor, and energy and time this represents is only fully appreciated by those who have attempted even in a small way to perform similar tasks. The accompanying photograph will give a slight idea of what extraordinary efforts have been made to secure the necessary equipment to push the work forward at the Isthmus. This photograph shows the loading on the Panama steamship "Colon" of some of the large steel Goodwin cars used for transporting and distributing excavated material. This material is wasted by discharging trains of these cars operated by compressed air from the locomotive. These huge cars are to be loaded by steam shovels with 5½-yard buckets that scoop out masses of earth and rock weighing 10 to 12 tons in a single scoop. The French in their efforts to accomplish this work used small cars and small locomotives with the idea that the saving in labor to keep up the road-bed for a light equipment would offset the smaller amount of material hauled in a train; but the fallacy of their methods has been too plainly shown to need argument, and the present Com-



Loading Cars for the Panama Canal on the Steamship "Colon."

interests. Neither the Peninsular and Oriental nor the Royal Mail could have built up their large fleets without the commercial confidence given by their subsidies, and as the Collins vessels always beat the time of the Cunarders, they probably would have been driven off the passage if it had not been for their subsidy.

In addition to the Collins line our lines to Havre and Hamburg were "driven off the passage" by relinquishment of the practice of subsidizing our vessels. Our Hamburg line has expanded into the Hamburg-American line, and if we had continued our practice in the British spirit its magnificent fleet and immense political influence would have been American.

In its issue of Jan. 5, 1906, the *Iron and Coal Trades Review*, London, says: "The total volume of British shipbuilding turned out in 1905 has exceeded that of any previous year in the history of the trade. It amounted to 1,806,000 tons. . . . The year closes with excellent prospects. The quantity of work on hand on Dec. 31, 1905, is estimated as being about equal to one-half of the output of an average year. In other words, British yards may be regarded as closing the year with about six months work on hand, which is an unusual and highly enviable position." But Mr. Meeker tells us: "To-day the world is confronted by an over-supply of ships. . . . Shipyards are working short time and turning out work at prices very little above cost."

It is not intended by the above citations to imply that Mr. Meeker, who is undoubtedly a thinker, has relied entirely on his internal consciousness for his views as to the commercial status of the shipbuilding industry. This is the third time that a boom

mission has shown its ability to cope with the problem by arranging to use an adequate equipment and by "getting the line of the canal into a condition which will enable them to operate an excavating plant to the best advantage."

JOHN M. GOODWIN.

The Operation of a Busy Terminal District.*

BY C. H. KETCHAM,

Division Superintendent, Delaware, Lackawanna & Western.

"A Busy Terminal" covers a good deal, and the writer must admit that he has hardly known where and how to begin. The busier a terminal the more need of a good organization and system. When a terminal is crowded and demands are exacting then is the time that good organization and system counts and enables the yard to give better service and handle more cars with its facilities.

Considering tide-water facilities where freight is allowed to be held 10 to 30 days for lighterage, and 60 days for export, to save delay to car equipment, and handling of cars in continued switching, and have freight handy to deliver to boats, ample closed piers should be provided, classifying freight for the different piers, the yard having standing orders to place the commodities to piers on arrival. For open freight, ample storage tracks should be provided where possible to have the cars convenient for placing along the string piece for delivery. A large outer hump yard should be supplied with ample receiving tracks and storage tracks for coal, sufficient number of tracks to switch coal to sizes, when train is switched, and holding capacity large enough to hold two days' unloading. A holding freight yard should be provided with tracks of from 40 to 50 car lengths, and enough of them to classify freight when the train is switched. When cars are ordered from freight yard to water front or piers, cars for each pier should be clustered together when not enough for solid trains for each pier, to save switching at the inner yard. Tracks to different piers should be so arranged that cars can be pulled from the shed track and cars lined up on other tracks ready to be placed to pier, thus saving delay to labor waiting for more cars. Transfer engines should be used for transferring to and from outer yard, not doing any switching. Team track room should be sufficient to place cars at night, and not interfere with unloading during the day. Enough float bridges should be supplied to enable loading and unloading of floats with least possible delay. Leading to floats, a receiving yard of five or six tracks, long enough to hold the longest train, should be provided, and tracks leading from this to tracks for the lining up of freight for New York piers, and so constructed that cars can be shoved on to floats without any more switching. The eastward provision pier for export freight and westward pier, where barge freight is loaded into cars, should be located in connection with a receiving and despatching yard, so that cars received can be placed while switching trains of manifest freight, and westward freight can be placed without delay in westward trains. All switching possible should be done in outer yard, where it can be done cheaper and keep the force down in the inner yard, where fewer the engines worked more can be done by those worked.

We may have all the tracks and piers required, but without good power and without good management, by those who have charge of the work, we may not give good service or get the best out of the facilities furnished. It should be borne in mind that because we have room to get the car unloaded on the pier, it is none the less important to get the car moved from pier to destination and that good service must be rendered by the lighterage department, or else the final successful movement has not been accomplished.

The freight agent and his department has much to do with successful handling of terminals or the undoing of same. The writer believes that enough attention has not been given to the necessity of proper organization of this department. This department deals directly with shipper and handling of a freight station. Much depends on this department, whether the shipper is satisfied or otherwise with the service rendered by the company. A man filling the position of freight agent at a large terminal should have the ability to discern what is necessary to do to serve the shipper, and at the same time protect the company. He should be a man broad enough to realize that he should not agree to demands upon the yard that are unreasonable and not practicable. He should realize that it is easy to write out switching orders, but not so easy to do the switching. He should be careful to not promise service that may not be accomplished in the time asked for and in the end disappoint the patron. He should have his foremen and heads of different departments so lined up that they will work to this end, and feel their responsibility in this direction; he should know that simply ordering cars placed does not serve the company, but getting the work done does. The agent's office should be liberally supplied with telephones, should issue freight notices promptly, answer correspondence promptly, not only to patrons, but to officers, so that all can give information asked for promptly, thus giving

the public satisfaction. In these matters alone, business may be held or lost—and solicitors of freight do not know why we lose the business. We do not hesitate to put on enough engines to move the number of trains required, or allow enough switch engines to do the work. Why should we fail in giving ample or efficient force to collect the revenue or serve the public as it should? The agent should be the directing power or the medium for the public. The yardmaster must realize this and they should be in close touch.

This can be helped very much if the superintendent will hold conferences with the agents of the terminal. The general yardmaster should attend these. He then learns the situation as a whole, can better appreciate the necessity of good service, the agents get a good insight of this work and they can see matters from the best standpoint. This means better handling of a terminal. All are in touch with the situation.

The company should provide a liberal number of district yardmasters, well paid, with a good office building having good conveniences, well taken care of, with a sufficient and efficient office force to keep proper records; the men should be trained to the necessity of following up detail matters, making the office organization as strong as the offices of the different heads who are compelled to get information from that of the general yardmaster; installing a system of records that are complete, not burdensome, but giving quick information. There should be a good telephone service with a liberal number of 'phones located at points where the district yardmasters can be reached easily, and good results will follow. The superintendent should feel that he is responsible not only for moving the traffic over the road and through the terminal, but that he is responsible if the company loses a good patron. He should keep in touch with public demands, and his actions in these matters will be an incentive to the employees. After all, there should be no department; in fact, all should work together, thus serving well the company. Superintendents should keep in touch with the traffic department, taking advantage of their assistance, calling upon them to give their services in the way of getting shippers to accept freight or placing for a time the acceptance of certain freight. When this is done the traffic department can give great assistance. They are then conversant with your difficulties, and not in the dark, and thus working at a disadvantage with the public. With this co-operation a large terminal can and will be handled successfully.

A brief description of the working of the terminal of which the writer has charge may be of interest. There are greater and probably more complicated terminals to handle, but it is probable that we have had more upset conditions to deal with. Possibly the increase of passengers handled per day, and coaches handled per train since 1901 has shown greater growth than most roads.

According to a statement dated March 10, 1902, we were handling 29,847 suburban passengers in and out of Hoboken per day. At the present time we are handling 40,163 per day, 45 per cent. of this number being handled in four hours.

In the passenger yard we have a track capacity for 410 coaches, consisting of 10 tracks; eight to 11 cars each, for receiving and despatching trains, three storage yards situated north and south of the eastward and westward main tracks, all equipped with gas, steam and water, so located that train can be switched from receiving tracks, storage yards or *vice versa*. Yard arrangements include "scenery track," Pullman car track, express, and track for the handling of 44 cars of milk per day.

In order to promptly clear the receiving tracks to take care of suburban trains arriving during rush hours on a minute headway, road engines are used to kick their own trains out of the receiving yard into the storage yard. Otherwise the receiving tracks would not be cleared fast enough. Trains made up of sleeping cars, or private cars, are handled only by engines attached.

While some of the cleaning of coaches is done in outer yards on the division, such as sweeping and dusting, the thorough cleaning of all coaches, milk cars, baggage cars and sleeping cars, is done at Hoboken Terminal, necessitating prompt handling of these cars to and from cleaning tracks in order to get them in proper shape prior to the despatching of trains. At one time certain cars were assigned to certain trains, but with increased business and to get the best movement out of the total number of cars, this has been done away with, with the exception of a few trains, such as club trains, where regular equipment is assigned. A combination baggage car is, however, assigned to each conductor.

In the despatching of trains, they are built up in the storage yards located on the northerly and southerly sides of the main tracks, from which yards they are kicked into the train shed, often two trains at a time, the separation being made before they pass through the interlocking. While these movements are being made into train shed from the southerly side trains may be moving out of the yard on the northerly side, or they are moving out on the southerly side while trains are being kicked in on the northerly side. In some cases the road engines may be used in backing in their own trains.

The passenger terminal service is taken care of by three yard

*From a paper read before the New York Railroad Club, Jan. 19.

engines by day, and two by night. The day engines have a conductor and six brakemen; night engines, a conductor and five brakemen. The switching movement to and from train shed, receiving yard, express yard and engine-house track is controlled by an electric pneumatic interlocking plant, consisting of 70 levers handled by three directors and six levermen on a shift of eight hours.

All eastward trains are scheduled to boats at Hoboken, with arrival shown at New York. In rush hours we have some cases where there trains are scheduled to a boat. The total number of eastward trains in suburban service is 104 in 24 hours, requiring 925 coaches averaging 45 passengers per car during the hours mentioned. From 8 a.m. to 9 a.m. 17 trains arrive, an average of 55 people per coach, or about 10,000 people in the hour. It is important that these boat trains should arrive at Hoboken on time, giving the passengers sufficient time to move from trains to boats and enable the latter to maintain their schedule. This necessitates the clearing of the receiving tracks very rapidly. All suburban trains carry baggage and the baggage goes on same boat as the passengers. It is the duty of the station master and assistant superintendent of ferries to see that trains make boats for which they are scheduled.

Westward trains are scheduled from New York and Hoboken. Trains are held for boats. Trains porters leave New York with each boat, and are the last to leave the boats, delivering a ticket to the assistant station master which indicates that the passengers have arrived for train for which they are scheduled. The conductor punches this ticket, acknowledging arrival of boat, then pushes indicator to main interlocking tower, giving notice that the train is ready to proceed. Switches and signals are then given for the movement of train, the director in the main tower passing the information to three other towers using a code of signals that indicates to the towermen at west end of tunnel whether train is going via main line or Morristown branch.

The rush movement westward is between 5 and 6 p.m., requiring 17 trains, 121 coaches, moving 7,134 passengers, an average of 58 passengers per coach. The make-up of these trains is seven to ten coaches each. A total of 106 passenger trains west in 24 hours is required for the suburban movement. We have, in some instances, three and four trains scheduled from one boat; consequently, if first train does not leave on time the two or three following trains are delayed, which affects the movement of following trains. This is due to boats being delayed by fog, weather conditions or barges or floats interfering with their movement. At the present time we have ten despatching tracks, but after our fire and up to a short time ago we were compelled to handle the service on six tracks.

In the entire movement of passenger trains it requires the handling over the turntable of 288 engines for the 24 hours, the greater number being handled between 9 a.m. and 3 and 4 p.m., averaging at that time an engine on table every three minutes.

The freight terminal consists of the Hoboken city freight station and team tracks located north of the passenger main tracks west of passenger yard, where local business is handled to and from Hoboken and steamship docks located at this point. The Hoboken terminal station is located south of the canal. We have an open pier, storage tracks, three covered piers, a canal 3,000 ft. long where lumber and other rough freight is handled direct to boats and to cars, three float bridges, and two coal dumps all located south of canal. From 1,400 to 1,600 cars, freight and coal are handled daily between passenger trains in and out of Hoboken, requiring a freight train movement of 85 to 95 trains. From 6 a.m. to 10 a.m. and 2.30 p.m. to 6.50 p.m. nothing but manifest trains can be moved in and out of freight yard. The switching required for placing cars on team tracks, open docks, covered piers, coal docks, grain trestle, float bridges, etc., show an average of five movements to each car, or 200,000 movements for 40,000 cars handled.

Because of closed hours, this leaves but 16 hours for the movement of freight and manifest trains. The latter must leave the yard on schedule or serious delay will follow. All orders for the placing of freight are given by the agents on a regular switching form to be placed in the hands of the yardmaster not later than 6 p.m., and call for the special delivery of from 800 to 1,000 cars to be placed in position for unloading by 7 a.m. This includes orders issued for cars to be delivered to floats, etc. Manifest and local trains are built up in the Hoboken yard, the others being handled in an outer yard (Secaucus).

All coal is cut out at Secaucus and there switched into 32 different sizes, according to the number of consignees, in preparation for moving into Hoboken and there placed in size lots for unloading to boats.

Ten engines, double crewed, are required in the Hoboken freight territory, making a continuous performance except during the time they stop to take their meals, clean fires and coal engines. The traffic from Secaucus to Hoboken and return, except manifest movement, is handled by transfer engines.

Owing to the large number of passenger trains moved, transfer engines have to be handled during the hours of the day that will

enable them to accomplish their work without interfering with passenger trains. The freight movement easterly through tunnel is accelerated by the use of pusher engines, but these engines are not allowed to enter the tunnel.

Movements in and out of Hoboken, freight and passenger, are governed by the tunnel. Trains are operated through tunnel under control of slotted semaphore signals, they being controlled by track circuit, and trains moved only on clear block. The train movement through tunnel, including passenger, freight and transfer engines, shows an average movement of every 13½ minutes east, and 12½ minutes west during the 24 hours. From 7.30 to 9.30 a.m. the eastward movement averages a train every 3½ minutes and from 4.30 p.m. to 6.30 p.m. westward every four minutes.

Daily Train Tonnage Chart.—C. & E. I.

The possibilities for increasing the tonnage moved per train by systematic loading of each locomotive to its practicable maximum are fully appreciated by operating officers, particularly those whose facilities are taxed to the limit by the volume of traffic offered, or perhaps are unequal to the task of moving it. But in order to accomplish this effectively each officer must know the results day by day and have the individual and collective performances constantly under his eye. A daily examination and analysis of the superintendents' records of train movements is, of course, out of the question for the busy manager or vice-president; therefore he will need to have the results submitted to him in some compact shape that will inform him quickly and comprehensively of the situation. This is the purpose of the accompanying chart, which was devised by Mr. H. I. Miller, Second Vice-President and General Manager of the Chicago & Eastern Illinois, in setting out to secure an effective increase in the average train load of his road. This chart presents for his instant inspection all of the essential information relative to one day's northward freight train movements; northward only, because the line being primarily a coal road, the heavy traffic is mostly one way—toward Chicago.

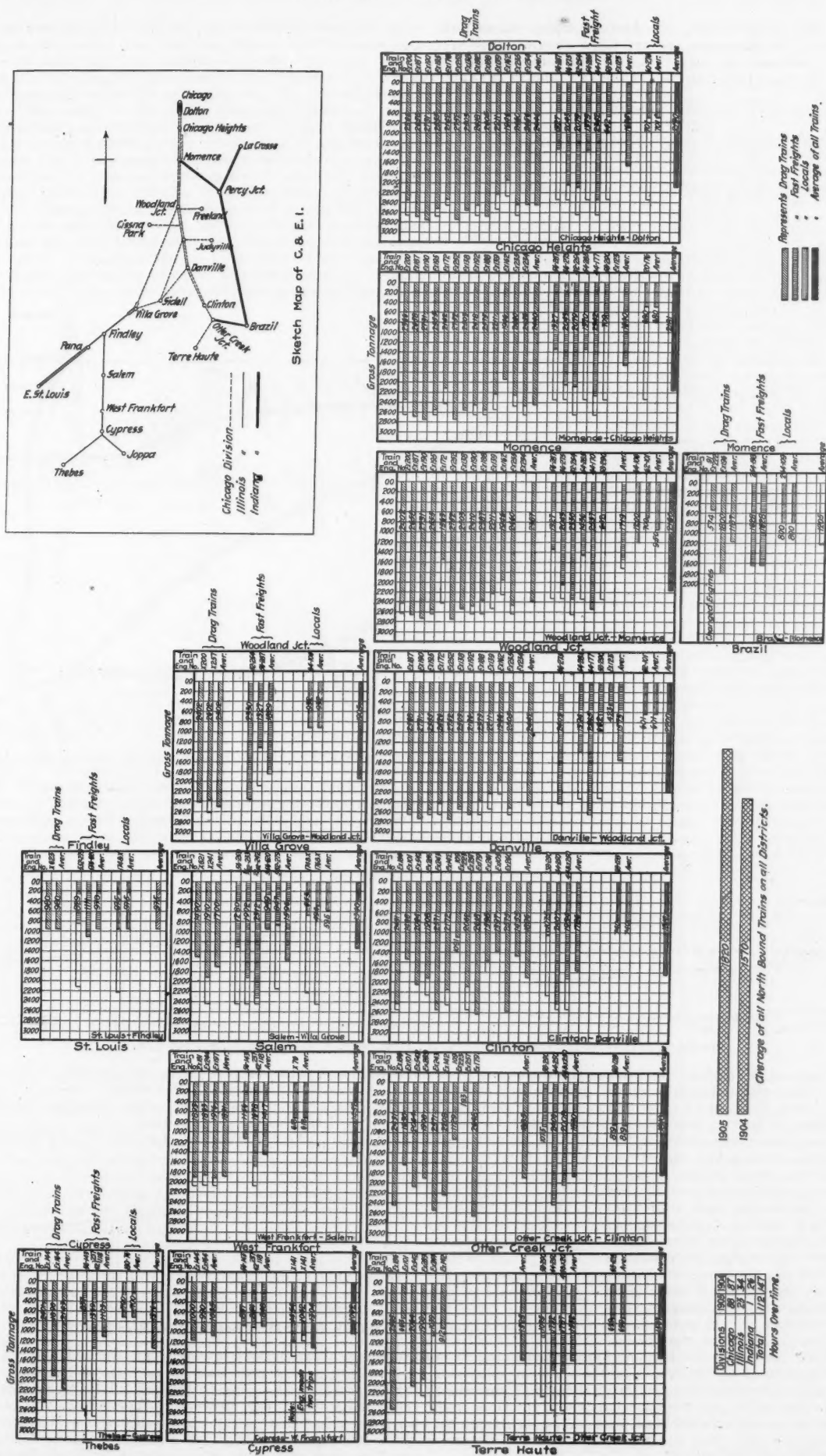
Besides the main line from Terre Haute to Chicago, which carries the heavy traffic, the chart includes the lines of the Chicago & Eastern Illinois to Brazil, Ind., and to Thebes, Ill., and shows the St. Louis trains, which run over the joint Big Four-C. & E. I. line between St. Louis and Pana, Ill. It should be noted that in its general arrangement the chart conforms to the layout of these lines, as may be seen by reference to the sketch map in the upper right-hand corner, included for that purpose.

In explaining the chart, the main line only need be considered. The original of the chart is drawn on profile paper, the size of the sheet being about 18 x 33 in. The spaces from right to left in each of the large divisions or rectangles represent gross tonnage, in increments of 200 tons. Each small elongated rectangle or block within the large rectangles represents a train, the engine and train numbers, identical in many cases, being entered at the right-hand end of each. The "drags," or heavy coal trains, which on the main line constitute the heaviest traffic, are set down first, in the upper portion of each large rectangle. Next to them come the fast freights, and then the local freights. The average for each of the three is shown in connection therewith and the average of all appears at the bottom. The length of the train block indicates the rating or hauling capacity of the locomotive and the shaded portion the actual tonnage of the train, which also is entered in figures in the block. On the actual chart the portions of the blocks shaded in the engraving are colored, four different colors being employed. The "drags" are blue, the fast freights red, the locals green, and the total average, yellow.

The divisions into the large rectangles indicate the several points on the line where important changes in the make-up of the train usually occur. At the bottom of the sheet the average tonnage of all northbound trains for the day is set down to suitable scale in comparison with the similar figure for the same day a year ago, the actual tonnage also being given. These also are colored yellow. In addition to the data enumerated, the temperature for the day is recorded on the sheet, also the hours of overtime, by divisions, compared with a year ago. Any reduction in locomotive rating due to the weather is also noted. While the record shown herewith is not the reproduction of an actual day's performance, it is representative of performances daily being obtained.

The charts are prepared in the drafting room. The blanks on which the information is entered are printed from a Van Dyke negative, the large rectangles being blank where train tonnage and train numbers are entered. These are filled in by the draftsman from information furnished by the car accountant. The chart does not reach the general manager until several days after the date of the record. Meantime the general superintendent's office makes up a report regarding delays and other matters affecting the train movements, which is used in checking up results as recorded by the chart.

In connection with the chart shown herewith, a graphic record



is kept of the daily temperatures, the sheet on which the record is kept showing the temperatures by days for a month. The current record is superposed on that of the corresponding month of a year ago and the mean temperatures for the two months suitably indicated.

This system, which is original with Mr. Miller, has been in use on the C. & E. I. only a short time, but already a gratifying increase in the daily average of tons per train has resulted.

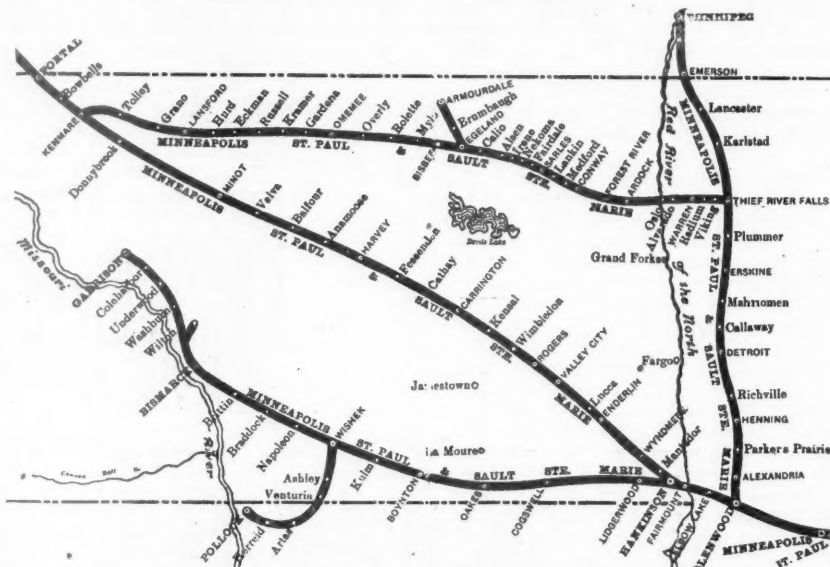
The Thief River Falls Extension of the "Soo" Line.

In many respects the most notable piece of railroad construction in 1905 was the building of the Thief River Falls extension of the Minneapolis, St. Paul & Sault Sainte Marie. Starting at Thief River Falls, Minn., on the Minneapolis-Winnipeg line of this road, it runs almost directly west through the counties of Red Lake and Marshall in Minnesota, and Walsh, Cavalier, Towner, Rolette, Bottineau and Ward in North Dakota, to Kenmare, on the main line from Minneapolis, the objective of which is the Pacific Coast. The total distance is 296½ miles, and the rapidity with which it was built is one of its features of note. The first dirt was moved on April 7, grading was completed November 15, and track laying four days later. The season was unusually wet, in fact the wettest experienced in this region in 14 years, and there was also a scarcity of laborers due to the great demand for harvest hands. These conditions caused unexpected delays to the contractors, both in grading and tracklaying.

Location was begun in September, 1904, and completed in April, 1905. It was made under a great many difficulties owing to the severe conditions of the winter weather. The location being practically all the way in a prairie country, the members of the engineering parties living in tents suffered a great many hardships owing to the numerous snow storms and blizzards. On the prairies it is very rare to have a calm day and with the thermometer ranging from zero to 45 deg. F. below for weeks at a time, a great deal of time was lost. On account of these conditions the practicability of doing any locating work during the winter on the prairies is very seldom counted on.

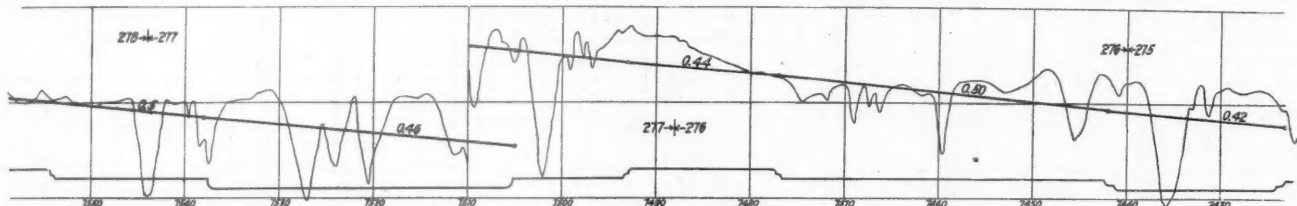
The line is remarkable in regard to its alignment and grades, there being one tangent of 50 miles and one of 40 miles, and numbers of others of 20 miles. The curvature is very light, there being

At the west end for the first 30 miles the work was heavy, averaging about 35,000 cu. yds. per mile, and being a hard clay material, it was very difficult to handle and very slow progress was made. The rest of the work was ordinary prairie work, averaging about 15,000 cu. yds. per mile, and no difficulties were met with except in obtaining laborers, which at all times were very scarce and difficult to get. The country traversed is practically without waste land and is one of the richest wheat belts in the country. It is said to be practically one continuous wheat field for the entire length of the line. A conservative estimate of the men shipped out from Minneapolis is 10,000, and not over 10 per cent. went to work on the railroad, the remainder mostly going to the harvest fields where wages of \$2.50 and \$3 a day and board, and \$6 a day for teams and board, were paid, against \$2 a day for men and \$4.50 for teams without board paid by the contractors. Under such conditions it is remarkable that the contractors were able to maintain a sufficient force and to get the work done.



Map of the Thief River Falls Extension of the Minneapolis, St. Paul & Sault Ste. Marie.

The plant force engaged on the work consisted of 30 grading machines used in connection with dump wagons, 14 of these machines being hauled by traction engines with a great deal of success, the rest of the machines being hauled by teams; three steam shovel plants, 300 dump cars and the necessary track, and 300 to



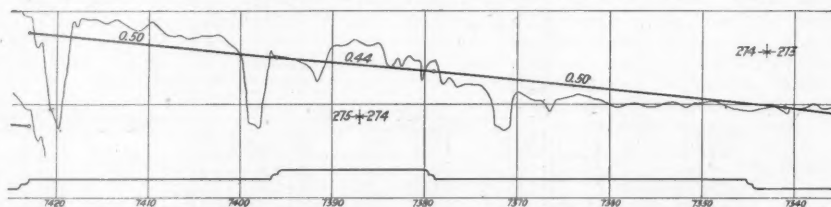
Profile of Heavy Work Done on the West End, Mile Post 275 to Mile Post 278.

but one 3-deg. curve at the extreme west end at Kenmare, two 2-deg. curves, and the rest 1-deg. and 30-min. curves, principally the latter. The grades are very light, being three-tenths of 1 per cent. east-bound from Grano, 275 miles west from Thief River Falls; west-bound grades are principally three-tenths, with the exception of the grades getting out of the Red River valley and the Mouse River valley, 20 miles east of Kenmare, which are five-tenths of 1 per cent. The line is well built with roadbeds in cuts 30 ft. wide and embankments 16 to 20 ft. wide, depending on their heights. The grading and construction work was let to Winston Brothers Company, of Minneapolis, the latter part of March 1905, to be finished by October 15, the company furnishing all bridge and culvert material.

At the east end of the line the country was very flat, wet and without drainage, necessitating practically all material being hauled on the first 15 miles, with extreme hauls of 1½ miles where it was contemplated being able to borrow along the sides. These conditions required the changing of the plant from wheelers and slush scrapers, which had been hauled in during the winter, to dump cars and track, and was the cause of considerable delay in getting the grading finished.

400 wheel and slush scrapers. The average daily force of men was 1,500, including teamsters and 800 teams. The actual number of working days was reduced to 120 after deducting loss of time on account of rainy weather and Sundays.

In grading the line there were 4,500,000 cu. yds. of earth handled,



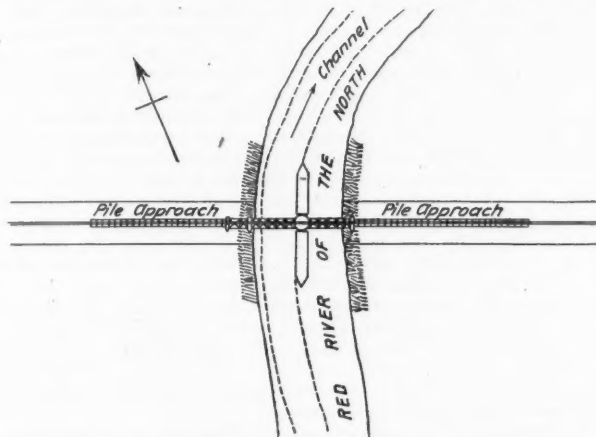
Profile of Heavy Work Mile Post 273 to Mile Post 275.

averaging about 38,000 cu. yds. each working day; 4,000,000 ft. b. m. cedar timber were used in culverts and 2,000,000 ft. Washington fir and white pine in bridges, all bridges being of timber construction, excepting the Red river crossing, which consists of a single-track, 241 ft. metal draw span and one 50-ft. metal through girder span. An outline drawing of this bridge is shown herewith.

The track was laid under contract by E. J. Brennan, of St.

Paul. Roberts tracklaying machines with rail and tie trams operated by steam were used. Track was laid from each end, commencing at the east end July 1 and at the west end August 11, which was about 40 days behind the time originally intended to commence at these ends, due to unfinished grade work. The tracklaying was finished November 19, and for each working day each crew averaged 2.1 miles of main line mileage besides laying 18 miles of side tracks and passing tracks and seven miles of tracks at two division points. The average daily force of each tracklaying crew was 110 (a full crew being 130 men), which would lay 6,500 ft. of track in 3½ hours, being full tied (3,000 ties to the mile) spiked and lined. This record of tracklaying is very remarkable, taking into consideration that the average per day did not include mileage of sidings, etc., and the delays caused in putting in 12 railroad crossings.

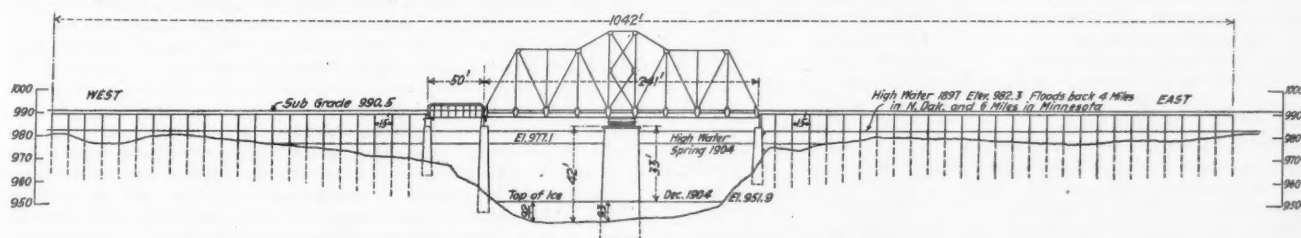
The road was put in operation for business December 4 with all depots, terminal plants, etc., built. A great many elevators, lum-



Plan of Crossing of the Red River, North of Grand Forks.

ber yards, etc., were built at the stations in advance of the track; also townsites were platted and towns started. As a result business started the moment the road was open for operation. Thirty-two stations were located on the line, including 11 junction towns.

In regard to the townsites, it may be interesting to know that of the 30 townsites owned by the railroad company, additions have already had to be platted at 24 of the 30 and towns of 400 and 500 people have sprung up with great rapidity, giving an idea of the



Profile of the Red River Crossing, Thief River Falls Extension.

character of the country passed through and the haste of people to locate therein.

In addition to building the Thief River Falls line, the company built the Underwood extension of 20 miles on the Bismarck line, and the Egeland branch of 21 miles, the latter a branch of the Thief River Falls extension, both branches being in North Dakota. It also did 10 miles of revision work on its main line in Minnesota, making a total main line mileage built for the season of 347½ miles.

We are indebted to Mr. Thomas Green, Chief Engineer, for the foregoing information.

The danger of making hard and fast general rules from headquarters has been illustrated in instructions intended to relieve car famines in Russia. There, the lack of cars is felt chiefly after harvest, when in certain parts of the country not only grain but great quantities of beet-roots are shipped, and the latter, of course, must be shipped before winter. Ordinarily, freight must be shipped in the order of its delivery at the stations; but in order that stone, timber, and such like freights which suffer less by waiting, might not prevent the shipment of grain, etc., which might spoil if left long, the authorities classified freights, and those of the first class had the preference over the second and third. The wisecracks who made the classification put lime in the third class, as an article which could very well wait. Now, lime is indispensable in making

beet sugar; and last of all, where the factories were deluged with the great crops of beets, they could not get any lime, and so could not use the beets till this little regulation was modified.

Visible Supplies of Grain.

The *Crop Reporter*, published by the Department of Agriculture, prints the following compilation of grain stocks, January 1, as compared with previous periods. The figures represent stocks of grain available at 62 of the principal points of accumulation east of the Rocky Mountains, stocks in Manitoba elevators, and stocks afloat on lakes and canals. Pacific coast stocks are shown only in the case of wheat.

Dates.	Grain stocks					Pacific C'st
	Wheat, bush.	East of Rocky Mountains, bush.	Oats, bush.	Barley, bush.	Rye, bush.	
1899, Jan. 1	50,126,000	26,936,000	10,893,000	4,372,000	1,573,000	15,923,000
1900, " 1	89,225,000	19,024,000	12,004,000	3,122,000	1,806,000	9,022,000
1901, " 1	87,911,000	14,313,000	15,861,000	5,395,000	1,651,000	8,686,000
1902, " 1	94,900,000	16,825,000	8,680,000	4,580,000	3,257,000	7,186,000
1903, " 1	80,769,000	9,345,000	8,794,000	4,389,000	2,454,000	4,992,000
1904, " 1	61,827,000	9,547,000	13,785,000	6,907,000	1,833,000	3,282,000
1905, " 1	61,240,000	15,351,000	31,343,000	10,403,000	2,504,000	3,458,000
Feb. 1	57,697,000	19,721,000	26,095,000	8,801,000	2,259,000	3,051,000
Mar. 1	52,907,000	16,752,000	22,570,000	6,952,000	1,961,000	2,726,000
Apr. 1	46,865,000	16,124,000	22,667,000	4,674,000	1,554,000	2,486,000
May 1	40,158,000	14,661,000	19,395,000	3,354,000	1,336,000	1,860,000
Jun. 1	28,532,000	8,374,000	11,325,000	2,231,000	1,064,000	1,461,000
July 1	20,476,000	9,571,000	11,174,000	1,557,000	920,000	839,000
Aug. 1	20,075,000	10,101,000	8,007,000	1,031,000	823,000	589,000
Sept. 1	21,705,000	8,808,000	20,597,000	1,358,000	1,081,000	1,230,000
Oct. 1	28,894,000	8,796,000	28,618,000	5,524,000	1,627,000	3,156,000
Nov. 1	47,841,000	5,183,000	37,526,000	8,509,000	2,251,000	4,486,000
Dec. 1	62,402,000	10,236,000	40,236,000	10,217,000	2,703,000	5,866,000
" 9	61,694,000	12,253,000	39,767,000	10,722,000	2,817,000
" 16	65,760,000	14,088,000	39,279,000	10,798,000	2,923,000
" 23	66,349,000	16,513,000	38,700,000	10,602,000	3,128,000
1906, Jan. 1	69,867,000	17,830,000	39,301,000	10,657,000	2,990,000

Recent State Railroad Commission Legislation.*

BY FRANK HAIGH DIXON.

Not since the passage of the Interstate Commerce Act has so much attention been given by the people at large to the "railroad question" as during the present year. President Roosevelt's vigorous stand for an Interstate Commerce Commission with powers adequate for the performance of its duties, was the opening work in the discussion. For the hastily prepared measure which was rushed through the House, the Senate substituted a committee to take testimony. The sessions of the Elkins Committee provided the opportunity for a general expression of opinion on the question of railroad control, including the views of railroad men, shippers and students of the problem.

But the attention of the people has not been turned toward questions of interstate commerce alone. The state legislative sessions of the year have been unusual in the amount and character of the legislation introduced and enacted, which has aimed to give greater control to the states over transportation agencies, especially in the matter of charges. Missouri enacted a maximum freight-rate bill and one relating to the classification of freight; railroad commission bills passed one house in both Idaho and Colorado; in Oklahoma a commission bill which combined features of the Texas and Kansas laws failed through non-concurrence of the two houses in amendments; in Nebraska one attempt was made to create a railroad commission, and another to restore the Board of Transportation abolished in 1901, but both failed, and in their place a constitutional amendment was submitted to the people for the creation of an elective railroad commission. In Montana a commission bill failed to become a law through the governor's veto; in New Jersey a bill providing for a supervisory board was introduced; and bills were under discussion in Iowa and West Virginia.

Finally, acts were passed in four states—Washington, Indiana, Kansas and Wisconsin—providing for the creation of state railroad commissions. It is the purpose of this article to consider these four measures and to point out their significance in relation to the

*Abstract of an article in the *Political Science Quarterly* for December, 1905.

problems of railroad control now so widely discussed. In Washington and Indiana no legislation of this kind has ever been enacted before. Such slight control as has been exercised heretofore over railroads in these commonwealths has proceeded from the general railroad law common to all states. In Indiana the Grain Dealers' Association two years ago presented a bill to the legislature, but failed to secure its enactment. Their defeat led to a more thorough organization of the forces interested in the movement, and in 1904 the Indiana Shippers' Association was created, containing representatives of thirty commercial organizations. This influential body secured a pledge in the platforms of both parties for an improvement in transportation conditions; both candidates for governor expressed themselves favorably, and pledges were secured from candidates for the Legislature. When they found the Legislature nearly unanimous for a change, the railroads went into a conference with the shippers, and after a three days' session a bill was drawn up which passed both houses of the Indiana Legislature with only two dissenting votes. Kansas has had a much wider experience with legislation of this character. A railroad commission was created there in 1883 which continued in existence for fifteen years. It had power to investigate cases, to discover violations of law and to inspect railroads at its discretion, but no power to prescribe rates except upon complaint. One of the last acts of the Populist Legislature in 1898 was to abolish this board and substitute for it a so-called Court of Visitation, consisting of a chief judge and two associate justices, whose duties covered cases pertaining to rates and traffic and to the physical condition and technical operation of railroads. This august body was disposed of by the state supreme court in a decision which held the act creating it void on the ground that in it "legislative, judicial and administrative powers are so inextricably interwoven as to render their separation impossible." In 1901 another commission law was passed almost identical with that in existence up to 1898. This law has now been amended to such an extent as to constitute practically a new act.

Railroad control in Wisconsin began in 1874 with the passage of the famous "Potter law," under which a definite schedule of rates prescribed by the Legislature was to be administered and enforced by a commission of three men. The law proved to be so stringent and so ill-adapted to the industrial conditions of the state that it was repealed in 1876, and a single commissioner, elected by the people, was substituted, with general supervision of railroad service. It was his duty to discover violations of railroad law and to inspect, at his discretion, the operation and equipment of railroads. But he had no power over rates, and such decisions as he rendered in his limited field could be enforced only through appeals to the attorney general, or, still more indirectly, through reports to the governor. It is needless to say that railroads were little interfered with in matters which vitally concerned the industrial interests of the state. The commission law recently enacted is the outcome of Governor LaFollette's campaign for a reform in the railroad tax laws and an increase in the tax levy. He found that the railroads would probably meet the demand for an increase in the amount of tax by an increase of rates. Therefore he introduced into the Legislature of 1903 a very stringent act based on that of Iowa, providing for the creation of a railroad commission with power to prescribe a schedule of maximum rates. This was followed by a special message to the Legislature which included a detailed study of rates in Wisconsin, in comparison with the commission-made rates of Iowa and Illinois. The result showed that the rates of Wisconsin were from 25 per cent. to 50 per cent. higher than those of either of the other states. The bill passed the House, but was defeated in the Senate by a powerful lobby, consisting of railroad officials, manufacturers and shippers. Then followed an interesting campaign of education. The governor continued his investigations into the rates of Wisconsin and adjoining states, he spoke at almost every county fair in the state, and appealed directly to the people in an endeavor to strengthen and crystallize the reform sentiment. The railroads met these appeals with arguments and addresses prepared by their attorneys and traffic experts. They were aided by a large number of manufacturers and shippers, who insisted that a commission empowered to fix rates would have in view absolutely equality and would be compelled to adjust rates on the basis of distance, thus depriving shippers of the advantages derived from commodity rates under which raw material could be secured advantageously and markets could be controlled. The governor replied that the support of the shippers was won either through intimidation or through secret rates and rebates, and that the welfare of the people as a whole demanded the abolition of all personal discriminations and preferences. The governor in this same year quietly pushed through an act authorizing the railroad commissioner to examine the books of the railroads, in order to determine whether the state had been defrauded of tax payments. According to the administration, this examination accumulated an enormous amount of evidence of the payment of commissions and rebates to favored shippers. Whether these disclosures influenced the shippers to withdraw their opposition, or whether they simply realized that the sentiment was too strong to be resisted, is uncertain. But the fact remains that when the railroad commission bill was again

introduced in January of this year the shippers' lobby was absent. The measure in its original form was a stringent one, but it was much modified in the course of its long and arduous passage through the two houses, and as finally passed is so reasonable and conservative that it can hardly be altogether satisfactory to its more radical supporters.

In the four laws under discussion there are a number of significant features worthy of consideration. The method of choice of the members of the boards is interesting. Kansas elects its commissioners at its biennial elections. The other three states provide for appointment by the governor. Fifteen years ago appointment of commissioners was much more common than election, 19 of the 28 states securing their commissions in this way; only six were elected by popular vote. But during the next 12 years the practice was greatly changed. The special report of the Interstate Commerce Commission on state regulation in 1902 shows that out of a total of 30 commissions, 15 were elected by the people and only 14 were appointed. This change was brought about by modifications in the laws of some of the Western and Southern states and by the adoption of the elective method in most of the new laws. That such a policy is out of harmony with the most efficient administration of railroad matters no student of administrative problems will hesitate to affirm. Experience has shown that the election of railroad commissioners on the state ticket has brought the railroads into politics in a most objectionable way, embittering the relations of railroads and people to the detriment of interests for which the commission is created, and giving rise to charges of bribery and corruption of a most serious character. The chances of securing capable men are far greater through appointment than through choice by the nominating conventions of the political parties. It is therefore encouraging to find three of the four new laws providing for this method of selection, and that, too, in States whose populations would hardly be classed among the most conservative in the country. In fact, so unflinchingly did Governor LaFollette stand for this principle that he threatened to resign the office of governor and become a candidate for railroad commissioner in case the elective method (advocated, as he maintained, by the railroads) should be adopted.

Another encouraging feature which reveals itself in these laws is the change in the length of term of the commissioners. In Indiana the term is four years; in Wisconsin and Washington it is six years. Kansas, on the other hand, with the elective method, prescribes a two-year term. It must be apparent to anyone that a commissioner with a two-year term is retired at just the time that he is entering upon his period of usefulness. He becomes valuable to the state in the intricate problems of his office only after a long apprenticeship.

In the power granted to the commissions over rates these four laws are all thoroughly conservative. In no one of them is power given to the commission to prescribe a classification and complete schedule of rates, but in every case the power is limited to the correction of individual rates. The most common form of the law in the past has been that which made it the duty of the commission to prescribe a complete schedule of rates for all traffic within the state. Seven states had this form in 1890 and 13 in 1902, and most of the recent commissions have received this power. The action of these four states is, therefore, all the more striking. It might be fair to conclude that Legislatures are coming to realize the absurdity of expecting three men, chosen without regard to their fitness for their duties, to assume as their first task a problem which it has taken railroad experts years to solve even approximately. In all four acts the railroads are required to file with the commission their schedules of rates. These schedules having been filed, no change of any kind can be made in them in Wisconsin, and no increase in Indiana, without 10 days' notice; in Kansas the adoption of a new schedule by a road must be reported to the board within 10 days. In Indiana the board may alter these rates of the railroads only upon complaint, but in the other three states the board may proceed upon its own motion. In all the states except Kansas the rates fixed by the commission are absolute; in Kansas it is unlawful to raise without permission the rate which the commission has prescribed, but a rate may be lowered if the benefit of the decrease is enjoyed by all shippers. This power to prescribe absolute rates is given to the boards for the purpose of preventing discrimination, which is generally regarded as a more serious and prevalent evil than excessive rates. Power to prescribe a maximum rate has never reached effectively the fundamental difficulty in the railroad situation. In Indiana the commission has power to approve of group rates, and the Wisconsin law permits all forms of commodity, concentration and special contract rates under the regulation of the commission, which guarantees their enjoyment to all shippers alike. It has been the contention of the railroads and the large shippers that the tendency of government-made rates is toward an absolute level of equality, with no adequate consideration of situation, markets and local conditions. These provisions for special rates are intended to meet this difficulty.

Although the jurisdiction of these commissions is limited to State boundaries, the four laws all contain a provision intended to

protect shippers against excessive or inequitable interstate rates. This clause provides for the filing of a complaint with the commission and the reference of the complaint to the offending road, as in the case of unjust state rates. If the roads disregard the notice sent them by the commission, the Interstate Commerce Commission is applied to for relief. This carries out the suggestion of section 13 of the Interstate Commerce Act, which provides that the commission "shall in like manner investigate any complaint forwarded by the railroad commissioner or the railroad commission of any state or territory at the request of such commission or commissioner." This excellent plan secures a complainant before the Interstate Commerce Commission who has no personal interest in the outcome, is well informed, capable of estimating the importance of a grievance and of presenting it in an effective way, undeterred by fears of personal injury or annoyance.

In form of procedure to be followed, appeal may in Wisconsin be taken to the court from the order of the board on questions of law—that is, to determine whether the order is reasonable—but this does not operate to stay the order. If the railroad elects to pray for an injunction against the operation of the commission's order, such an injunction may not issue until after notice and hearing. In Kansas the railroad that appeals to the court from the order of the board is not liable for any violation of the board's order pending the court's decision. In Washington the plan has been adopted which was so many times proposed in the testimony before the Elkins Committee, providing that if the court is of the opinion that the order of the commission is unreasonable or unlawful, it may suspend the order pending litigation, in which case the court shall require a bond from the railroad covering all damages caused by delay in the enforcement of the order, all penalties that would attach under the law and all compensation for sums paid by shippers in excess of the rates ordered by the commission. In Indiana the court may suspend the commission's order pending review, provided a bond is filed to cover damages, penalties and over-payments, as in the case of Washington; but the law further provides that the railroad executing such a bond shall issue to each shipper and passenger a certificate showing the rate charged and containing a promise to repay the difference between this rate and the commission's rate, if the order of the commission is upheld. If the court sustains the commission, these certificates become payable on demand. This cumbersome scheme was the compromise plan which resulted from the three days' conference between shippers and railroads. It would seem probable that its success will come, if at all, from the fact that the roads will be inclined to accept the findings of the commission rather than assume the burden of clerical detail which a contest in the courts will involve.

In the solution of the question as to the value to be placed by the court upon the commission's findings, the Indiana law provides that the court shall hear the appeal upon the transcript of testimony from the previous hearing. In the Washington law the complainant before the board, if dissatisfied with the board's decision, may appeal to the court and the case is then tried *de novo* without jury. The Wisconsin law provides that if upon trial of the action the court finds that evidence has been introduced by the plaintiff different from or additional to that offered in the hearing before the commission, it shall stay the proceeding for 15 days and transmit a copy of the evidence to the commission. The commission may then rescind or amend its original order in the light of the new evidence and report to the court within 10 days. This Wisconsin plan was evidently suggested by the rough manner in which the courts have handled the findings of the Interstate Commerce Commission. Its working will be watched with the greatest interest, and may be worthy of adoption into our national law. It makes the record of the commission final.

Annual reports of the railroads to the commission are required in the usual form. The Wisconsin law introduces the wise provision that the blanks prepared for reports to the commission shall conform as nearly as possible to the Interstate Commerce classification. This practice is being followed voluntarily by many commissions, but a legal provision requiring it has a tendency to hasten a most desirable consummation, when state and national reports will be drawn up on the same forms, and be capable of more intelligent comparison and study. All the laws include in their scope private car lines, sleeping car companies and express companies as well as railroads proper. Street and interurban railways are excluded in Indiana and Washington, and street railways in Kansas and Wisconsin. Kansas, in connection with its legislation in opposition to the Standard Oil Company, gives to its railroad commission general supervision of the transportation of oil by pipelines, which are made common carriers. The commission is authorized to prescribe maximum rates for the transportation of oil.

Much might be said in criticism of our state railroad commissions. Their apparent inefficiency is, however, in most cases to be attributed to their limited jurisdiction and to the steadily growing importance of interstate commerce over which they have no control, as well as to the fact that much of their most enduring work in harmonizing the relations of shipper and carrier is carried on informally and never comes into public notice. Whether the com-

missions have justified their creation or not, the people are not prepared to abandon this form of railroad control until something more efficient offers itself. Therefore it is a source of gratification that the most recent legislation of this character should prove to be so conservative and so much in harmony with the best sentiment of the country on railroad questions.

Award of the John Fritz Medal.

The second award of the John Fritz medal has been made to George Westinghouse, for "The Invention and Development of the Air-Brake." This medal was established by the professional associates and friends of John Fritz, of Bethlehem, Pa., on August 21, 1902, his eightieth birthday, to perpetuate the memory of his achievements in industrial progress. The award was made by the following board selected for the purpose:

From the American Society of Civil Engineers: Alfred Noble, Chas. Warren Hunt, Charles Herman, C. C. Schneider.

From the American Institute of Mining Engineers: James Douglas, Charles Kirchhoff, E. E. Olcott, E. G. Spillsbury.

From the American Society of Mechanical Engineers: Robert W. Hunt, S. T. Wellman, James M. Dodge, John E. Sweet.

From the American Institute of Electrical Engineers: Charles P. Steinmetz, Charles F. Scott, B. J. Arnold, John W. Lieb, Jr.

The medal is of gold, of a value of about \$100, and with it is presented a certificate of the award.

The Local Agent.*

I first viewed the local agent from the standpoint of a brakeman, and to my mind his only employment consisted of making all possible work and trouble for the brakeman, and reporting him on every occasion that presented itself.

Afterwards, as way freight conductor, I was positive that from the time the train started until we tied up, the agent was doing nothing but making out switch lists that were invariably incorrect. From my point of view it was his constant delight never to have a bill ready and a car sealed on time.

As I grew older in the service, I acquired a determined opinion that when Mr. Agent had exhausted his own mental efforts, he never failed to consult with some higher authority to hatch up other devilishness to delay us.

But a little later in life, as a passenger conductor, I became more observing and lost some of my prejudice. I found out from remarks made by passengers that all agents were not useless ornaments. I heard a great deal in favor of agents who were courteous, well informed and first class servants of the company and the public. Of course, I heard some reports of a few misguided fellows who chose the opposite way of working, and at last it dawned on me that the agent was a very important factor in the organization of a railroad. I saw where it meant a great deal to the company whether or not they had proper representatives; I acknowledged the fact that at competitive points our interests to a great extent depended upon our representatives.

When I reached the position of Train Master, I had a better view of these fellow employees and I went into camp with them heartily. I entered into a partnership that proved most cordial and successful and received as much, if not more, assistance from the agents than from any other men in the service. It was he that called my attention to things requiring remedy in such shape that I could go to the superintendent intelligently. I found when he made a statement it was based on fact and was the result of good, thorough consideration. His loyalty and judgment were such that he was seldom found insincere.

Afterwards, as superintendent, in recognition of the interest which I felt I organized an agents' association. We got together the oldest agents at our meetings, but had all as members, and advised them of what we accomplished. We made our standing committees out of the experienced agents.

We made it a rule to invite a certain number of young men to each meeting so as to give them the benefit of the acquaintance and advice of the older men. I do not doubt that the ideas gained by the members saved much worry and indecision and awakened ambitions. By thus distributing a knowledge of good methods and interesting schemes, many a good man was kept from getting into a rut on account of his isolation.

The agent must carry ready at hand and use generously large doses of courtesy and common sense. There are no factors more important in his list of accomplishments than polite manners and an approachable personality. He must be "all things to all men" in spirit and in truth. The public demands these things and thinks it pays for them. He must "deliver the goods," he must breed work by being a busy boss and must keep cynicism and fault-finding far behind him.

*Extract from an article by W. D. Cantillon, General Superintendent, in "The North-Western Bulletin," a periodical published in the interests of the employees of the Chicago & North-Western Railway.

Washington Street Subway in Boston.

The report of the Boston Transit Commission for the year 1905 contains a complete description of the new Washington street tunnel now in process of building. It is a two-track structure for the passage of trains of cars north and south through the congested portion of the city connecting with the elevated structure at either end. These trains of cars at present go through the original subway between Pleasant street and Causeway street but in the future they will run through the Washington street tunnel, and the old subway will be restored to its original use as a route for cars from the surface system.

Work has been in progress on the tunnel during the year from near State street on the north to the southern limit, not far from Oak street. The general layout of the Washington street tunnel is shown in Fig. 1, and the profile by Fig. 2. The plan and profile show not only that portion on which the lines have been definitely fixed, that is, to the south of Cornhill, but also indicate one of the studies for the portion of the tunnel to the north of Cornhill.

Of the whole length of the tunnel—according to the plan referred to—50 per cent. will be straight, 33 per cent. will have a

in private land, it was necessary not only to adequately support all of the existing buildings which are over the tunnel but also to provide for taller and heavier buildings which are permissible under the building laws. These conditions were best met by a heavy roof of steel beams and concrete supported by reinforced concrete side walls and by a line of steel posts between the tracks. North of Kneeland street, as will be seen from the map, "staggered" station platforms occur at frequent intervals as near the surface of the street as is practicable, and at these platforms the roof is made of steel beams and girders with concrete arches between. Where there are no platforms, and where a considerable depth exists, the tunnel is covered by an arch with tie-rods. In all parts of the work the contingency has been provided for that the pressure of the earth may be removed on either side of the tunnel while a heavy load is being carried on top and a pressure is exerted by the earth on the other side. This provision is not usually made in masonry subways in other cities, but the conditions of narrow streets and the frequent construction of buildings with deep cellars appear to demand it here.

Little or no provision has been made for the positive ventilation of street subways constructed in other parts of the world. Ade-

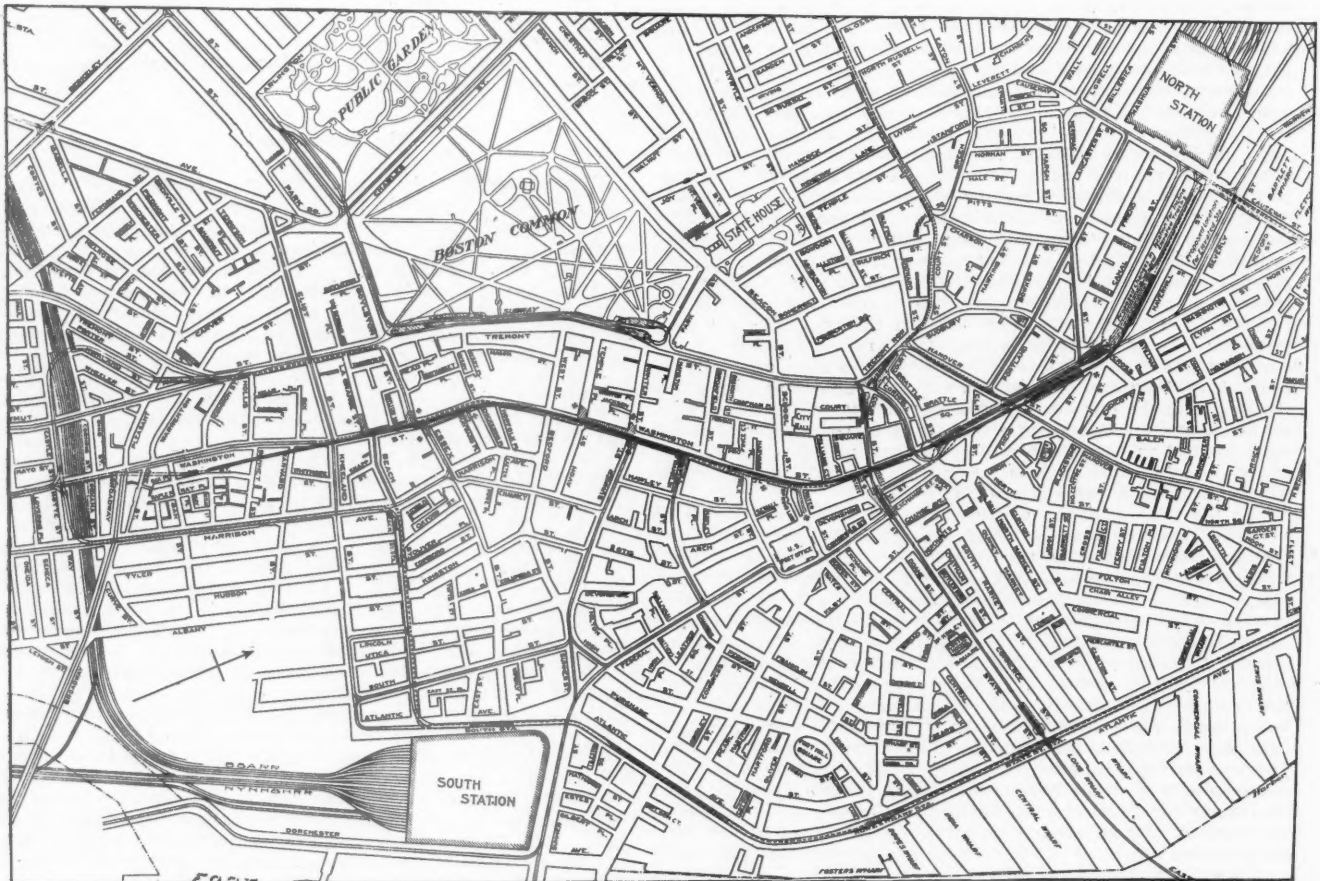


Fig. 1.—Map of Business District of Boston Showing Elevated, Surface and Subway Lines.
Washington Street Subway Indicated by Heavy Black Line.

curvature of about 5,000 ft. radius, 2 per cent. of about 1,800 ft. radius and 15 per cent. of about 500 ft. radius. The grades are as follows: Of the whole length of the tunnel 40 per cent. will be level, 7 per cent. will have a grade of less than one foot in one hundred, 22 per cent. a grade of about two feet in one hundred, 13 per cent. from three and one-fourth to four feet in one hundred and about 18 per cent. of about five feet in one hundred.

A train going north and descending into the Subway, will be about 48 ft. lower at Eliot street than when on the elevated structure at Broadway. At Eliot street the track is about 21 ft. below the street surface and 5 ft. lower than mean low water of the sea. Continuing north the train will climb 19 ft. to Temple place. From Franklin street the tracks descend and pass beneath the East Boston Tunnel at State street at about the same level that they are under Eliot street. The lowest place in the tunnel, according to the profile shown, will be nearly under the old subway at Adams square, 28 ft. lower than at Franklin street. Continuing north the train will climb 52 ft. to the elevated structure at Causeway street.

The character of the cross-section of the tunnel varies greatly, determined by its situation and use. South of Kneeland street, where the tunnel is wholly to the east of Washington street and

quate fans and ventilating chambers were placed in the original Boston Subway and in the East Boston Tunnel, and will be provided in the Washington street tunnel. In accordance with the previous methods, fresh air will in general be admitted at the stations and drawn out of the tunnel at points between stations. In some parts of the original Boston Subway the air from the tunnel was discharged through gratings in the sidewalks, but this might be objectionable on the surface of the crowded sidewalks of Washington street. Tubes will, as a rule, be used to conduct the air from points where it leaves the tunnel to the points where it will be discharged, which will usually be above the subway entrances. These tubes will in some cases be below the tunnel and in other cases above.

The tunnel in Washington street is in no place far removed from and for most of the way comes close to the lines of the building. On account of the narrowness, crookedness and irregularity of the street and the frequency of the tunnel station platforms, the cross-section of the tunnel is very irregular and is rarely uniform for more than a few feet in length. Most of the sewer, water and gas pipes and other structures under the street, required to be moved to a new position and many service pipes are

to be laid cross-wise to connect with the different buildings. For these reasons most of the earth from the pavement down to the bottom of the tunnel is necessarily taken out. The work, however, has been carried on in such a way as to interfere but little with the traffic of the street. The method of doing the work has been similar to that employed on the streets when the original Subway was built. The paved surface of the street has been replaced little by little with heavy planking laid flush with the original surface of the paving and supported on timbers, and most of the work in the daytime has been done under this bridging. During the night much more of the surface of the street is occupied, but nevertheless enough space is left free so that fire engines and apparatus can pass through Washington street and in and out of any adjoining street, and this provision permits the passage of the

sections of 20 ft. lengths with expansion joints between. The roof was made continuous with a sliding joint at the junction with Section 1.

Section 1.

As this portion of the tunnel structure is entirely covered by buildings (except at street crossings), and as taller and heavier buildings may sooner or later replace the present ones, the walls, roof and foundations are strongly built. The walls and invert of Section 1 are of reinforced concrete. The roof consists of steel I-beams imbedded in concrete and supported on the side walls and a row of center columns. These beams vary from 12 in. to 24 in. in depth and are spaced from 1 ft. to 4 ft. apart according to the loading to which they are likely to be subjected.

The work was carried on from both ends and from shafts in

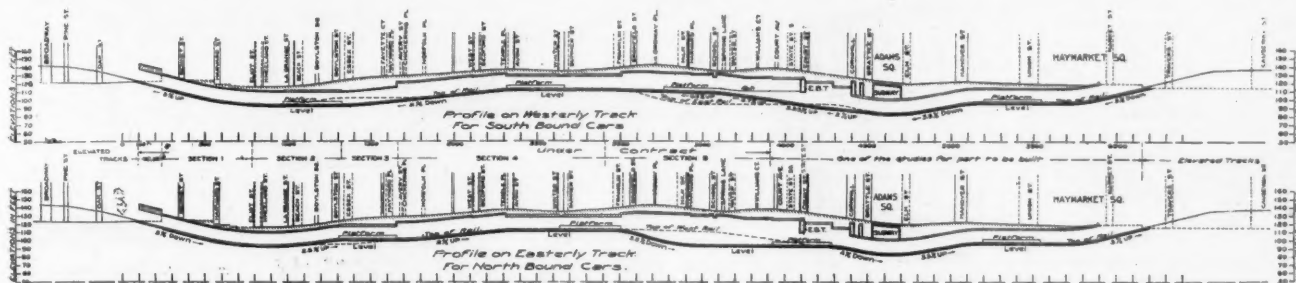
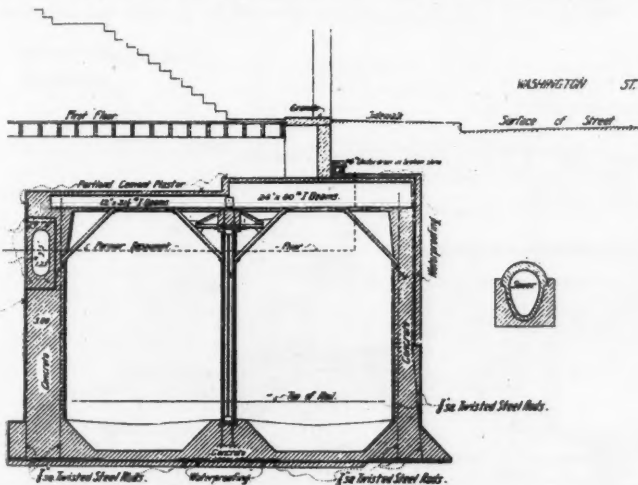


Fig. 2.—Profile of North and South Bound Tracks in Washington Street Subway.

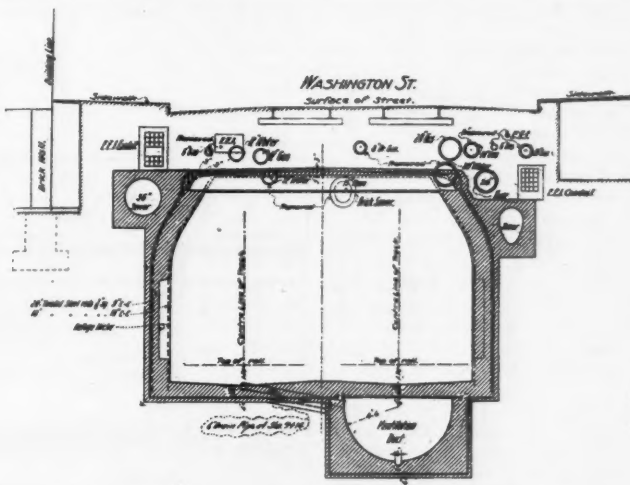
comparatively few teams used in the night. On Sundays and holidays the street surface is occupied in places in putting down new bridging and in doing other work for which the time in a single night is too short. The street railway cars are not diverted from Washington street in the day time except in case of emergency, but either the north or the southbound line, or both, are often diverted at night and on Sundays.

The work has been necessarily irregular and of a piece-meal character, but the order of doing the parts has generally been somewhat as follows: Underpinning is done where necessary; side walls are built in narrow trenches, one at a time; new sewers are built in or near them; interior posts, if any, are placed in a narrow trench; the roof is put on; the core is dug out; and finally the invert is completed. During this series of operations a large number of pipes of various kinds must be supported and changed

Bennet and Harvard streets in sections from 12 to 20 ft. in length. In excavating the sections to the required depth, the earth was filled into tubs which were carried on small cars to the shafts, where the tubs were hoisted and dumped into carts. After the excavation was completed, the floor or invert of the tunnel was built; the side walls were next erected; then the center columns and roof beams were placed in position and riveted, after which the roof was completed with concrete which surrounds the beams and fills the space between them. The invert and side walls were made almost wholly of concrete. The concrete was mixed by a Smith rotary mixer and carried to the several openings in iron carts. The building foundations were supported on steel I-beams during construction, and then pinned up on the completed roof with brick masonry. During the excavation and construction of each short section of the tunnel, the I-beams just referred to were supported



Cross-Section of Section No. 1, North of Harvard Street.



Cross-Section of Section No. 2, South of La Grange Street.

and considerable rearranging of braces and props must be made.

The work is divided into six sections; the southerly incline, section No. 1 542.5 ft. long, section No. 2 525 ft. long, section No. 3 333.5 ft. long, section No. 4 1,251.5 ft. long, section No. 5 1,013 ft. long.

Incline Near Ash Street.

The buildings where the incline is situated were taken down and their material removed between Sept. 8 and Oct. 6, 1904. They were mainly four-story brick structures about 60 years old. The retaining walls and roof of the incline are composed of concrete reinforced with steel rods. Above the surface of the ground the sides are open, for light and ventilation. Steel posts encased in concrete support the roof, on which is a monitor, about 8 ft. wide, open on the sides. The side walls from the floor of the incline to copings above the surface of the ground were built in monolithic

by blocking or posts resting on neighboring unexcavated earth or on the partially or wholly completed adjacent subway walls.

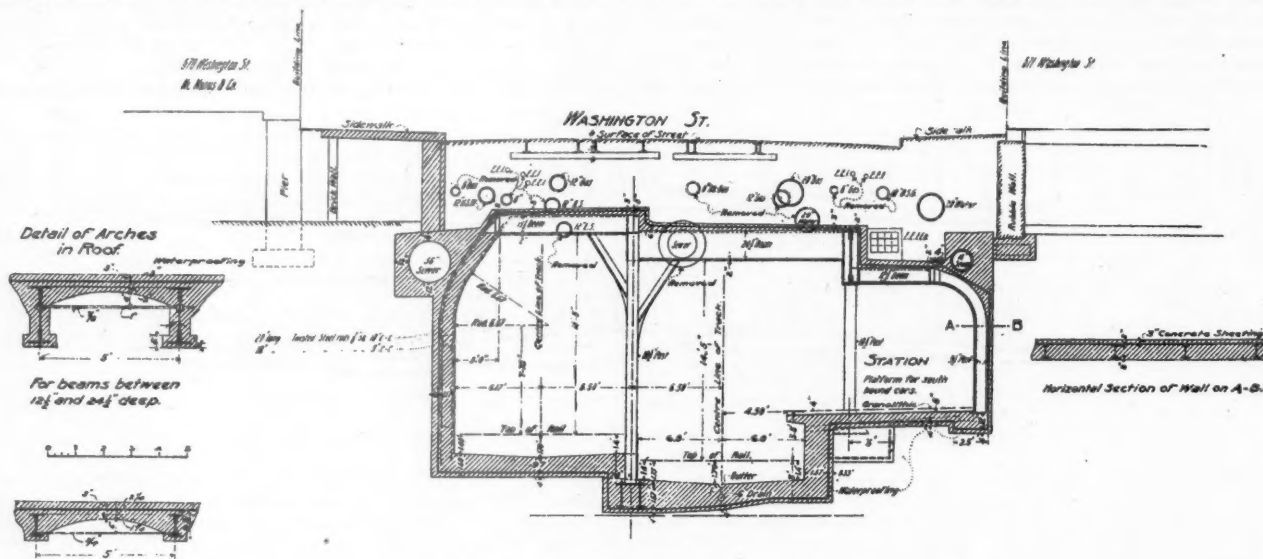
Generally the division walls and piers of the overhead and neighboring buildings were underpinned with brick masonry from the completed subway roof and on the sides of the subway down to an inclined plane, having an angle of 60 deg. with a horizontal plane passing through the bottom of the side walls. Concrete sheeting was used outside the easterly wall underneath the premises No. 710-740 Washington street, which sheeting was left in place. Everywhere else wooden sheeting was used, which was removed as the work progressed. The roof of the tunnel is below the street floors of buildings, except in the Sherburne building, where it is from 3 to 5 ft. above the street floor. This story is now being remodeled. The grade of the tunnel required the raising of the grade of Bennet street about 2 ft. This new grade run down to

the former grade at Washington street and at 50 ft. east of Ash street.

Section 2.

Where Elliot and Kneeland street cross Washington street, for a length of 40 ft., the structure consists of a concrete invert with reinforced concrete side walls and the roof of 15-in. I-beams, 5 ft. on centers, with concrete jack arches turned between the beams. For the next 120 ft. going north the invert and walls are of similar construction, but the roof is of a flat arch type with 15-in. beams

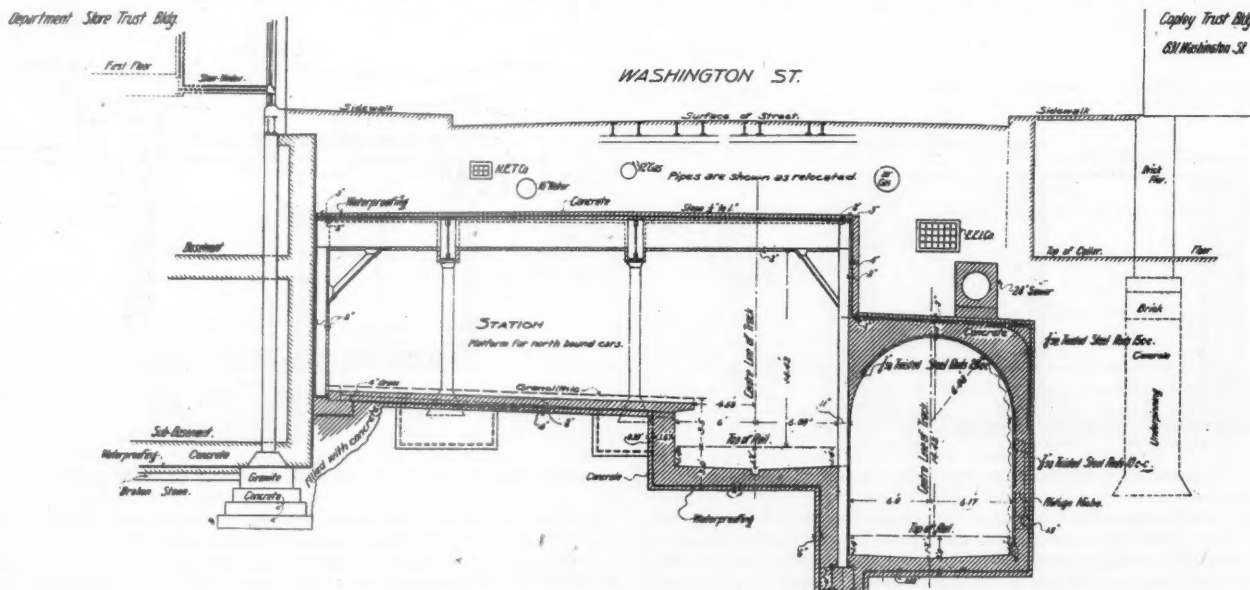
in advance of the main work of construction, and a contract was made for doing a portion of this advance work. Operations began on the evening of Sept. 6, 1904, on the south side wall to the LaGrange street station, opposite No. 12 LaGrange street. Four days later, work in Washington street was begun on an opening for the pump-well at the intersection of Beach street. Work in LaGrange and Washington streets was prosecuted diligently, although great care was required, particularly in the former street, where the tunnel walls were horizontally within a few inches and



Cross-Section of Section No. 2, Near Beach Street.

imbedded in the concrete every 18 in. For the remainder of the section the invert is of concrete and the east wall of reinforced concrete; the west wall consists of steel columns spaced 5 ft. on centers surrounded with concrete; two lines of center columns carry girders extending longitudinally with the tunnel, the roof beams extending across the tunnel resting on the side walls and these girders, and between these beams, which are 5 ft. apart, concrete jack arches are turned. Where this last type is used, there is a station platform from 11 to 17 ft. in width on the west side of tunnel for the accommodation of southbound trains. Approaches

vertically about 10 ft. deeper than the foundations of the adjoining buildings. After reaching the depth of these foundations, excavation was carried on generally in pockets 6 ft. long and the side wall erected therein before the intermediate pockets were excavated. In spite of the precautions taken, settlement took place on the LaGrange street side of the building situated at the north corner of Washington street. To obviate settlement on the Washington street front, the building was supported by spur-shores before operations were begun there. The foundation was then underdrun in pockets about 2 ft. wide, and strengthened by a wider concrete base



Cross-Section of Section No. 3, Near Essex Street.

to this platform extend into LaGrange and Boylston streets, distances of about 100 and 45 ft. respectively from the west line of Washington street. These approaches occupy practically the width of the two streets named, and have walls of steel columns imbedded in concrete, roofs of steel beams and concrete jack arches, a row of center columns and bottoms of concrete, eventually to be covered with a granolithic surface.

It was deemed prudent to have a portion of the side walls of the tunnel—especially where close to building foundations—done

about 18 in. in depth, containing 6-in. I-beams, this process being continued until the whole foundation had been strengthened. In that part of Washington street where the side walls did not come nearer than 8 ft. to the buildings, the length of the pockets excavated was about 16 ft.

The side walls of the section south of the station platform were built by separate contract. Excavation and masonry were carried on in alternate 16-ft. stretches, and new sewers at the same time built on each side of the street, the intermediate sections being

built afterwards. The Lyceum building and the Washington street front of the building at the south corner of LaGrange street were underpinned to the depth of the tunnel wall before excavation for the wall was begun. The buildings were spur-shored and the foundations carried on steel beams. Excavation was made to the required depth, and concrete walls and piers brought up to within 18 in. of the old foundations, the final pinning being done with brick masonry.

The construction of the side walls and sewers where the other contractors had left off was finished south of Boylston square, while the easterly side was practically completed to the south line of Boylston street. The house connections were then connected into the new sewers, and the old sewers abandoned. The work of excavating the core was then pushed ahead in LaGrange street and that part of Washington street where the station was located; in the former case the full width of the structure being taken, while in the latter a trench was dug first and the platform posts and

and heavy brick piers built up to the old piers. These brick piers were connected by a concrete wall which supported the lighter piers of the building. In the case of the Shuman building small cross-drifts were driven under the piers, and I-beams about 20 ft. long were inserted under the foundation. Another set of I-beams parallel with and close to the front of the piers were placed above the first beams and supported at the end on timber blocking, the first beams being supported from these by iron bolts. A large box was built upon the outer ends of the lower beams and filled with paving stones, thus forming a cantilever, the weight of the building being upon the short arm. The excavation and masonry work then proceeded as usual in similar cases.

Section 3.

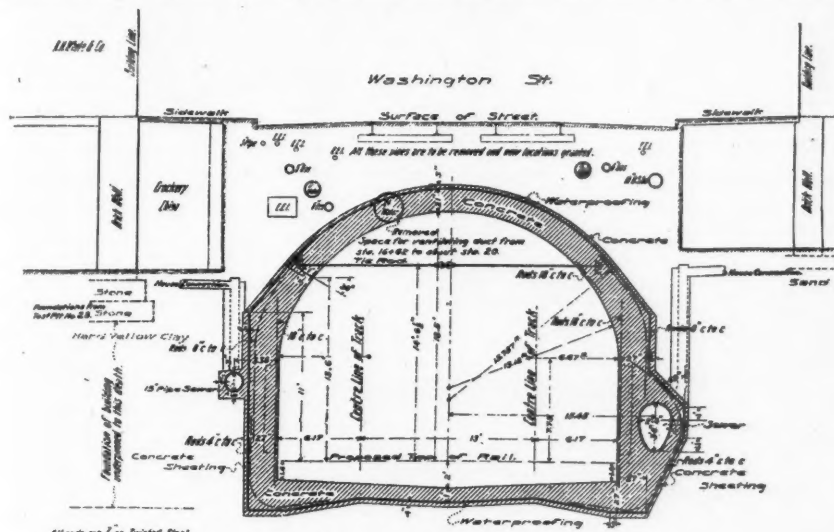
The structure varies in width from 53 ft. at the north corner of Essex street to 35 ft. at the north end of the section. The inverts are of concrete. The west side wall is also of concrete. From the center columns steel I-beams cross over the easterly track to a line of girders resting on columns in the station platform. The platform girders are connected to the east side wall by I-beams, the east wall consisting of I-beam posts every 5 ft. surrounded by concrete. The spaces between the beams are spanned by concrete jack-arches, the concrete being carried high enough to cover the whole structure.

The platform mentioned above is from 8 ft. to 26.5 ft. wide on the east side of the structure and is for the use of the north-bound trains. Approaches to these platforms extend into Essex street and Hayward place about 60 ft. from the east line of Washington street. These approaches have side walls of steel columns surrounded by concrete, steel center columns, and roofs of I-beams spanned between by small concrete arches.

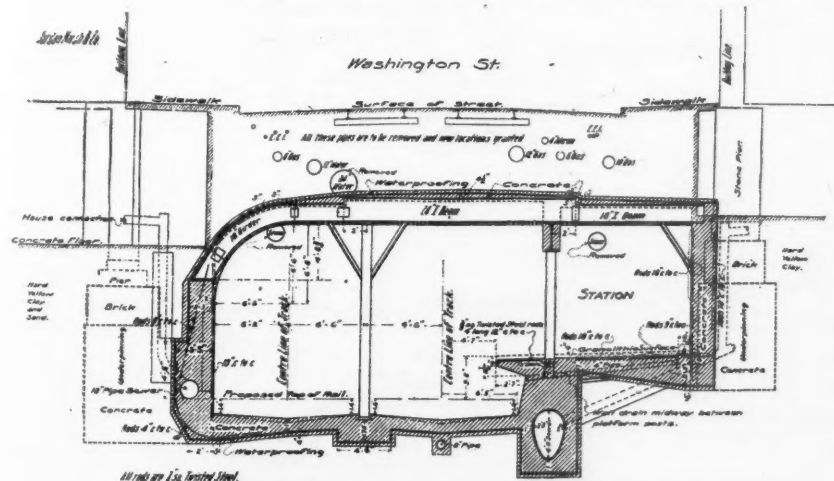
The contract for this section included in addition to the construction of the tunnel, the tunneling for and laying of about 600 ft. of 18-in. and 24-in. pipe sewers in Hayward place, Harrison avenue and Essex street as part of the necessary sewer changes in connection with the work. The contractors began on this sewer work on Dec. 20, 1904, at the intersection of Hayward place and Harrison avenue. Two days later, operations in Washington street were begun. During the first month the work was confined to these sewers and to excavating and building the west wall of the tunnel where it was not very near to building foundations.

Because of the depth and proximity of the tunnel, it was deemed necessary to underpin the walls of the buildings on the west side of Washington street from the north end of Section 2 to and including the south corner of the Bumstead building, a distance of about 140 ft., and also the walls of the Arioeh Wentworth building fronting on Washington street and Hayward place. Excavation for this underpinning was begun in the Hotel Cecil on Jan. 20, 1905. The general method was to partition off a portion of the basement and to cut through the walls and piers and support the building on heavy steel beams.

The general method in Washington street after the building foundations have been underpinned has been to build the west wall of the tunnel to the height of the springing



Cross-Section of Section No. 4, South of West Street.



Cross-Section of Section No. 4, North of Temple Place.

roof placed, after which the remaining width of the street was excavated in stretches about 40 ft. in length, the bottom concreted and the steel then erected and the roof finished.

In that part of Section 2 south of the station a different method was adopted. The street was excavated to a depth sufficient to allow the roof-beams to be set in position from side wall to side wall and the roof was finished first. The core was then excavated underneath and the earth taken in cars to near Kneeland street, where it was hoisted through a hatch and dumped into carts. As the excavation was completed, the ventilation duct and invert were concreted in short sections.

The contract for Section 2 included the underpinning of the buildings at the corners of Washington and Boylston streets—the Boylston and Shuman buildings. The Boylston building was underpinned by partitioning off a space about 12 ft. square about each one of the main piers, successively, cutting through the piers, and supporting them by heavy steel beams put through and under them. A hole underneath was then dug of the required size and depth

line of the arch, and then to excavate for and build the center wall to the springing line, after which the arch is turned.

In Essex street the first work consisted in connecting the 24-in. sewer already referred to by a new 24-in. sewer on the south side of Essex street to the new 3-ft. concrete sewer on the east side of Washington street. After this had been completed, the side-wall columns were placed and concreted in. Work on Washington street has been simplified by the diversion of the old sewer by a temporary wooden box sewer into the new sewer in Hayward place so that there is now not much sewage to contend with in Section 3.

Section 4.

From the south end of the section to Temple place the structure consists of a concrete invert, reinforced concrete side walls and a concrete arch with steel tie rods of 2.25 in. diameter spaced about 2.5 ft. apart. Between Temple place and Winter street there is a platform on the west side of the street for southbound cars, which is about 350 ft. long and from 16 to 17 ft. wide. From Winter street north there is a platform on the east side of the street for

northbound trains. This platform has about the same length and width as the other.

North of Temple place the roof of the structure is composed of steel roof beams placed 5 ft. on centers, with concrete arches between them. Between Temple place and Winter street the roof beams are supported by reinforced concrete walls and two lines of steel columns. North of Winter street the structure differs from the above in that steel columns are placed in the easterly concrete wall and the roof beams are riveted to them.

Owing to the proximity of the subway walls to the buildings, it was decided to underpin about three-fourths of all the buildings along the line of this section. The foundations of these buildings were carried down to the same depth as the bottom of the subway. The work was commenced about March 1, and was finished in June. The careful levels taken on these buildings showed no settlement greater than $\frac{1}{8}$ in., and that in two cases only.

As the new tunnel displaced the old sewer, it was necessary to build the side walls and the new sewers and to turn the flow of the sewage into these sewers in advance of much of the work in the center of the street. Work on this section was commenced on February 21, and has been pushed vigorously. Under the provisions of the contract the contractor was not allowed to remove excavated material south of Winter street between 7.45 a.m. and 6.15 p.m. except on Sundays and holidays. This required the greater part of the excavation to be done at night. The progress of the work indicates that the completion of the section may be expected somewhat in advance of the time set in the contract.

The mixing of concrete has been by machine, the plant being placed on Boston Common at the corner of Charles and Boylston streets. The contractor has also hired land at the Old Providence depot and also on the Boston Elevated property on Atlantic avenue, where excavated material and paving blocks are stored.

Section 5.

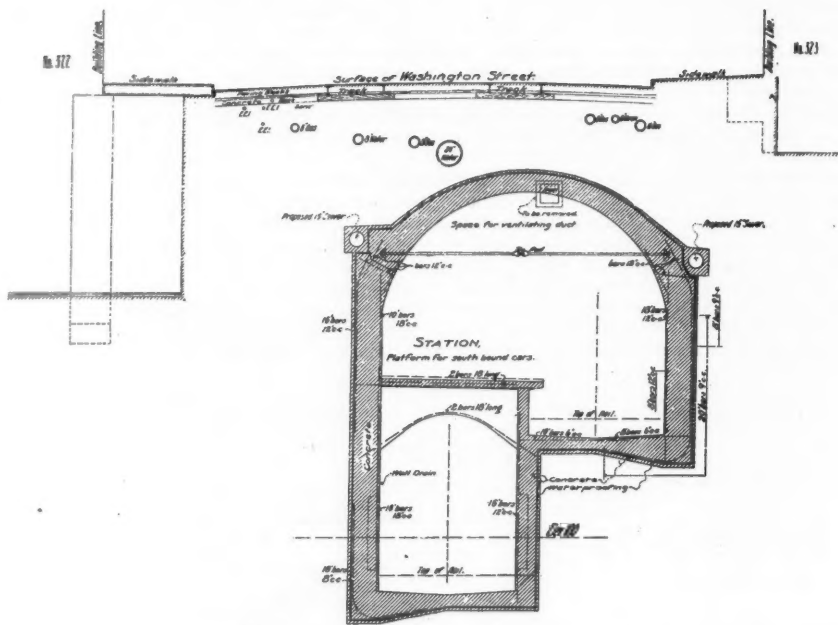
The structure will in general consist of concrete invert, side walls of reinforced concrete and an arch roof with tie rods. For a length of 100 ft. south of and across Franklin street, however, the roof will be constructed of 20-in. and 24-in. I-beams imbedded in concrete and supported by girders carried on two lines of steel columns. Steel columns are also placed 5 ft. apart in the east side wall the same as in the adjoining portion of Section 4.

The side walls between Franklin and Milk streets are under construction, the work being carried on in lengths of about 16 ft. Section 5 is deeper than the preceding sections, the bottom being from 30 to 48 ft. below the street. A feature of interest is that the track for northbound cars from about 90 ft. south of Milk street to the north end of the section is under the platform for southbound cars and the passageway leading to the State street entrance to the tunnel. From the middle of the Herald building north for a distance of about 110 ft. the west wall of the tunnel is under the front walls of buildings.

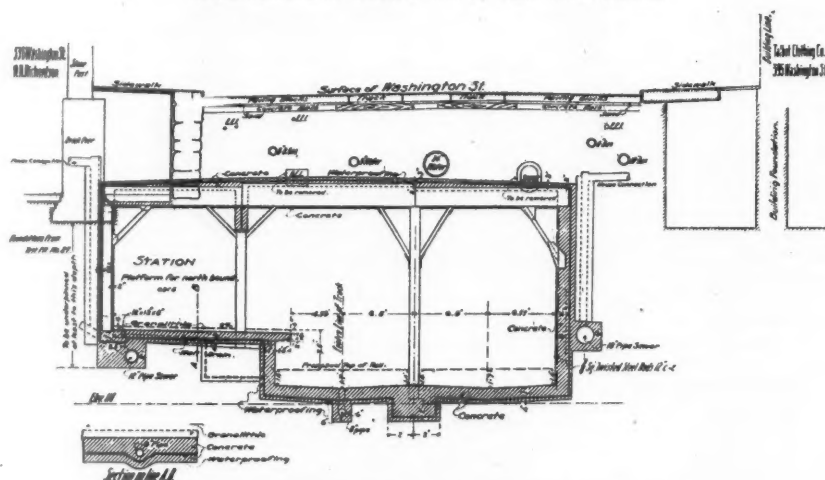
Relocation of Pipes.

In fixing the profile of the Washington street tunnel, a minimum depth of about 4 ft. of earth over the roof was decided upon to allow space for sub-surface structures in the street. The average depth between Kneeland and Franklin streets is $5\frac{1}{2}$ ft., with a minimum of $3\frac{1}{2}$ ft. at Summer street and a maximum of 9 ft. at Hayward place.

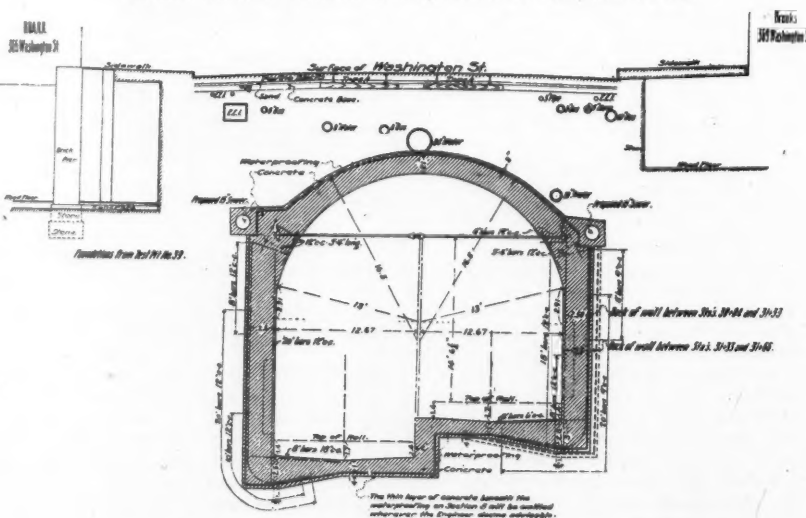
At most of the principal street intersections, and for the entire length of Section 2, the complete relocation of these underground structures has been necessary on account of the tunnel construction. Between these points, companies and city departments represented



Cross-Section of Section No. 5, Near Milk Street.



Cross-Section of Section No. 5, South of Franklin Street.



Cross-Section of Section No. 5, North of Bloomfield Street.

beneath the surface have asked that they be allowed to lay larger pipes and straighten their lines to conform to the necessary changes, and the Engineering Department has accordingly prepared precise plans showing a harmonious relocation of all of the principal underground structures in Washington street between Kneeland and Franklin streets. All new locations granted either by the Transit

Commission or by the city authorities have been consistent with these plans.

The new structures are laid under the direction of the Transit Commission engineers, who designate the precise location and the time of doing the work. In order not to incommode the public, much of the work of relocation is done under the planking which, during subway construction, forms the surface of the street, the contractor making the necessary changes in the timbering at the expense of the Commission. The relocation of all Washington street sewers within the tunnel limits has been necessary. The water pipes have been generally relocated in advance of the tunnel construction. The pipes have been supported temporarily by timbers while work was going on and permanently by brick piers resting on the tunnel roof.

The gas pipes have been removed at once by the Gas Company on being uncovered, so as to avoid danger of explosion, and small pipes have been substituted where necessary to supply the buildings, either under the planking or through the basements between side streets. Over two miles of gas pipes have thus been removed between Harvard and Franklin streets, a distance of about 2,400 ft. The permanent gas pipes have not been replaced in any locality until after the tunnel in such locality has been completed and the street backfilled.

The concrete of the electric conduits has generally been removed as soon as the tunnel excavation would allow and the cables hung or looped up out of the way. This with the removal of the gas pipes has given the contractors much additional space in which to work, and has greatly reduced the task of supporting the pipes. The new conduits have been laid for the most part on the tunnel roof under the planking before the street has been backfilled. The capacity of the electric light conduits has been materially increased and eventually all of the old Edison three-wire solid tube system over the tunnel will be removed and replaced by cables drawn through these conduits. The building connections will be made through pipes laid from the manholes. The two 10-in. pneumatic mail tubes crossing the tunnel at Eliot and Kneeland streets were relaid in advance of the construction of the tunnel roof.

Washington street has been continuously patrolled by water, gas, and electric light inspectors, the Water Department men carrying a red flag by day and a blue light by night for identification, and despite the fact that bare electric light and power cables, water and gas pipes, pneumatic tubes, etc., have been carried on timbers in the open excavation where some settlement is inevitable, no accident at all serious to property or person has thus far resulted.

Local Freight Agents' Problems.*

When 800 pounds of small castings are put into a sugar barrel, and handled from the dray to the warehouse, and then to the train, and perhaps a transfer en route, the chances are that the castings are loose, with no marks, and when they are unloaded at destination there is a shortage and a consequent claim. I think there should be some restriction as to the weight of castings put in a barrel, or some kind of a package specified to put them in that would "hold." It seems to me that about all the shipper looks out for is to get something to hold until he gets the receipt from the railroad company; then they can take care of the rest, so long as the classification has been complied with.—W. O. Allen.

The local agent is a much more important personage than is usually supposed, and instead of letting the public think he is a funnel through which they are to communicate with and hear from the superintendent, general freight agent, or others, he should let them think he is in a broad sense the general manager of the company's interests in that particular section of the country. The agent is always within reach of the necessary official by wire and can soon give them a reply on any subject. If you seek to work closely in connection with prominent shippers you will always handle their business with energy and satisfaction to them, but if they come to you and you ask them for a letter and say you will submit it you will find they will write to some official direct the next time.

If a rate is not quoted promptly or a shipment is delayed, do not assist the patron in his abuse of the company by offering no defense, but pour oil on the troubled waters and when you get back to the office let no time pass until you have done your full duty in trying to fix it up; then give him the results, so he will know of your interest. Complaints are always right or wrong—if the former, admit it and try to suggest something to prevent similar complaint in future. If they are wrong, explain it, and defend your service; the pursuing of such a policy will cause shippers to think more of you and the company.

Above all, do not dodge the issue and put it up to a superior with the idea that he will turn it down anyway, and that you can show the shipper his reply.

I have a great deal more respect for an agent now than I had

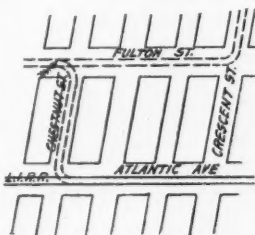
*Extracts from articles in "The North-Western Bulletin," a periodical published in the interests of the employees of the Chicago & North-Western Railway.

when I was one of them. I think I am safe in saying you are of such recognized value to your superior officers that you should weigh your subjects carefully and then make your recommendations, and I am sure the subsequent action will convince you of the consideration given your views, even though they might conflict with others.—S. F. Miller, A. G. F. A.

Some time ago we had a lot of choice flour in cotton sacks damaged by being loaded into a car that had been loaded with ice. The flour was wet, so the loader put in a lot of hay and then a layer of boards. Apparently the flour was well protected and would go to destination in good shape, but the hay was sticking up in places between the boards, and the water gradually filled the hay, and each one of these straws carried the water to the flour like so many little siphons, with the result that the lower tier of sacks was wet and caked badly.—L. O. Matthews.

Accidents on the Brooklyn Elevated.

On Friday, January 19, the middle car of a three-car train on the Kings County Elevated Line was derailed at the switch at Fulton and Chestnut streets, Brooklyn, and fell to the street, killing one passenger and injuring about 15 others. As will be seen by the accompanying sketch, the main line of the elevated makes a sharp bend just beyond the point where the accident took place. Just before this bend is reached, at a distance of approximately seven miles from City Hall, Brooklyn, a connection leads down a sharp incline on Chestnut street to the surface line of the Long Island railroad on Atlantic avenue, with which connection is



Location of Accident.

made for Rockaway Beach. During the summer months, the switch at this point is connected with the signal tower, but in the winter no trains are run over the connecting track and the switch is disconnected from the tower and spiked in position. On the day of the accident a special train, containing officers of the road, was to be run over the Rockaway Beach line for purposes of inspection. An employee accompanied this train, who was to have unspiked the switch to allow the special to pass over it. Another employee had been sent

ahead to assist him upon arrival of the special, but the one sent ahead misunderstood his instructions and unspiked the switch without noticing that it was not connected with the tower. He did this just ahead of the regular train which preceded the special. The first car of the regular train followed the main line; the second car, not a motor car, was derailed by the loose facing point, and the third car turned down the incline. There was nothing in any way obscure about this accident, as the daily press has claimed. It was simply a case of a careless employee who did not follow his instructions.

On January 22 the Brooklyn Elevated had another accident, which fortunately did not result in loss of life or injury to persons. On this occasion the motorman of a Myrtle avenue train ran by the signals at the Fifth avenue junction, near Brooklyn Bridge, and a Fifth avenue train from Bath Beach struck the rear car of the first train with sufficient force to twist it about at right angles with the tracks. An inspection made immediately after the accident showed clearly that the motorman had run by his signal, since the pipes were so damaged by the derailed car that it would have been impossible to move the signal after the accident occurred.

Washington Correspondence.

WASHINGTON, Jan. 23.—Some progress is being made with the railroad rate bills in the Senate and House Committees. Chairman Hepburn had expected to report his bill to the House last Friday, but the Democratic members of the Committee wanted still more time and the Committee adjourned until to-day, when there was unanimous agreement to report the bill. Unanimity is what has been sought after and what has caused most of the delay thus far. With this end in view the Republican members of the Committee made several modifications in the text of the Hepburn bill to make it more acceptable to the Democrats. None of the changes made is of much importance, but the Democratic members of the Committee have been insisting upon one of a more radical character. They wanted the Republicans to agree to eliminate from the long and short haul clause of the present interstate commerce law the words "under substantially similar circumstances and conditions," so as to prohibit absolutely a less charge for a short haul than for a longer one over the same line of road, in the same direction, the shorter distance being included in the longer, subject to a provision authorizing the Interstate Commerce Commission

to suspend the prohibition. This amendment, however, was not incorporated into the bill as finally agreed upon.

An amendment of the long and short haul clause is one of the distinguishing features of the bill introduced in the House by Representative Davey, of Louisiana, the senior Democratic member of the Committee. This Davey bill proposes to go much further than any other measure thus far introduced in either house of Congress in the direction of giving the Commission discretionary power. It would enable the Commission to give or withhold favorable rates through the power to enforce or suspend the long and short haul clause, and it would extend to 30 days the time required for notice of an advance or reduction in rates, giving the Commission power to enforce this requirement or to modify it or suspend it at will.

The members of the Senate Committee are apparently as far apart as at the beginning of the session. The Dolliver bill, the Foraker bill, the bill presented by the Interstate Commerce Commission, and the Elkins plan for a compromise bill have each been discussed in turn by the Committee, but without any agreement on any of the important differences between members of the Committee. In the meantime, there has been more discussion in the open Senate. Senator Clay, of Georgia, on Monday delivered a long and carefully prepared speech on the question of the power of Congress, under the Constitution, to delegate the legislative power of fixing a rate for the future, contending that it could be done constitutionally. Senator Foraker, who is looked upon as the leading exponent of the idea that the Interstate Commerce Commission cannot be constitutionally empowered to pass upon the question of the reasonableness of rates and to make rates for the future is expected to make a lengthy reply to Mr. Clay in the near future. These two speeches will mark the lines on which the debate will be conducted in the Senate on the Constitutional questions involved. There is no present indication of a division on party lines in the Senate, though it is noteworthy that in the debate that followed Senator Clay's speech on Monday such an adroit politician as Senator Aldrich, of Rhode Island, attempted to give the discussion a political turn. It is apparent that if Senator Foraker and the other conservative Republican members of the Committee on Interstate Commerce can succeed in having the Republican members of the Committee agree upon a bill that will give to the courts the power, at some stage of the proceeding, of passing on the question of the reasonableness or lawfulness of a challenged rate the Senate will divide on the bill on very nearly party lines. A few Republicans may refuse to support such a bill and it may receive the support of Senator Morgan and possibly one or two other Democrats.

J. C. W.

The Education of a Station Agent.*

BY W. C. HUNGERFORD.

Having made up our minds to put our best efforts into our work, the next step is self-control. This is needed in all business, but especially in the railroad business. Look at the groceryman. He puts on his smile with his clothes and carries it all day until he closes the store. See the farmer's wife drive in with the eggs and butter. He goes out to the wagon and takes out the farm products, puts up the groceries, with some candy put in for the children, talks of the crops and makes himself agreeable. He has to, and as you see him you say to yourself, "I am glad I don't have to." You make a mistake. If you could meet the busy world with a happy smile and the kindly attention of the tradesman, how much easier your work would be and how much more business you could accomplish. You would have to learn it if you worked for the grocery man, or worked for yourself.

There is not the same code of morals between the public and railroads as between individuals. The other day I overheard a young lady as she got off the train saying to her friend who had met her, "I have been signing some other person's name so long I have forgotten my own." I learned that she had bought a return portion of a ticket from a scalper in the east and signed the original owner's name. She would not have forged anyone's name to a check, but would do anything to beat a railroad company. When I spoke of this before my minister he stated that he always got a ticket from a scalper if he could. I gave it up and noted that it is evident the ten commandments do not apply to the treatment of railroads. The agent has to stand against this.

The condition of the business man is not as good as it was 25 years ago. The combination of capital is fast getting possession of all business that is of any profit, and crowding out the individual dealer. The great department stores are fast eliminating the local dealer.

The tendency to escape from the farm has filled the land with doctors, of schools too numerous to be mentioned or remembered, and lawyers everywhere, until the observation is that few earn

more than a mere living, while in our business there has always been a great demand for competent men, and the demand is greater to-day than ever before. We make no investment of money and know that our pay is surer than our best bank. Our hours are shorter than the average business man and they are working under as many restrictions as we, and are more closely subjected to the requirements of the public they serve.

Along the line of sentiment there is no class of men who have more real regard for each other and protect one another's interests more carefully than railroad men, and our experience with the management is that they do the same with us, for when we meet a general officer we always meet a friend, and it would take a longer paper than this to relate the scrapes they have assisted us out of in 25 years, and we are still on speaking terms.

Mistakes that with other employers would only have been settled with money, I have never been asked to pay for. Not long since, when I thanked an official for his help in a matter of transportation, he said: "It gives me pleasure to put any happiness in a railroad man's life." We must look on the bright side and realize that the things which annoy are a part of the business and not allow ourselves to be overcome by them.

Let us take a kindly interest in the business of our patrons, and endeavor to turn dull labor into pleasure. If they are contemplating a trip, give them all the information you can and show your desire to add to their enjoyment. I was pleased with some brakemen I once met in crossing the Continental Divide, who displayed a real and active interest in calling the attention of passengers to features that might have been overlooked by one unacquainted with the scenery. These men found relief from what must have been monotonous to them, by giving pleasure to others, and adding much to the comfort of their trip.

We have the advantage of others, in our ability to travel, and there is nothing that adds so much to the pleasure of life as seeing the different parts of the country, or that helps an agent so much in his business. A man can be more effective in soliciting business when he can describe by actual experience the many objects to be seen and the best manner of reaching them.

There is not much danger of our becoming unsettled in life by comparing our line of railroad with others, or our circumstances with the condition of other men in like positions. I have noticed that when I meet a man who once worked for the North-Western Line, he always speaks of it with pride, and I have yet to find one who said he found things more to his liking on the other line. On the contrary, his advice invariably is, "Stay where you are."

Automobile Testing Plant at Purdue University.

Purdue University, Lafayette, Indiana, has installed an automobile testing plant. The design of the plant has been worked out under the direction of W. F. M. Goss, Dean of the Schools of Engineering, assisted by Professors J. R. McColl and W. O. Teague. It is quite similar in principle to the locomotive testing plant also

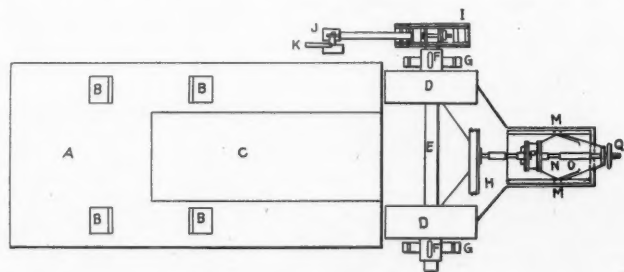


Fig. 1—Plan of Automobile Testing Plant at Purdue University.

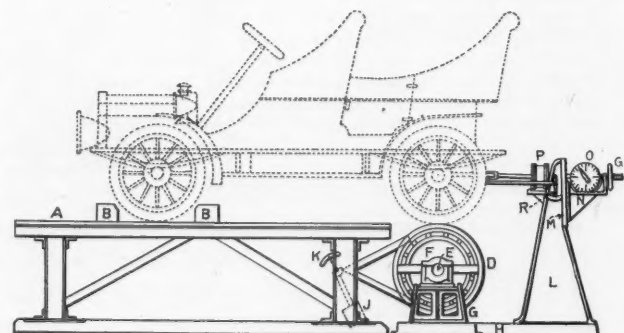


Fig. 2—Side Elevation of Automobile Testing Plant.

*Extract from an article in "The Northwestern Bulletin," a periodical published in the interests of the employees of the Chicago & North-Western Railway.

at Purdue. An automobile of any type, whether steam, electric or gasoline-driven, may be mounted, operated and tested on it and the power delivered and the efficiency of the machine may be determined. A plan and elevation of the plant are shown in Figs.

of the machine, thereby freeing the laboratory of obnoxious gases.

Concerning the theory of action, a glance at Fig. 2 will make clear the fact that if the supporting wheels were blocked so that they could not turn, the automobile would, if started, tend to move

forward with its full tractive power even to the extent of slipping its wheels upon the supporting wheels. Its tendency to move forward in this case will be registered as a pull upon the dynamometer. If, on the other hand, the supporting wheels are frictionless, then the turning of the wheels of the automobile through the action of its machinery will not result in any pull upon the dynamometer, for if frictionless, the supporting wheels can offer no reaction for such a pull. The supporting wheels are, in fact, neither blocked nor frictionless, but the design is to have them turn against a resistance the value of which may be varied at will. The arrangement is such that whatever this resistance may be it appears as a stress on the draw-bar. The resistance is regulated by means of a friction brake to which reference has already been made. By its adjustment the automobile may be made to pull any amount on the dynamometer; it may run under a light or a heavy load as may be desired. In all cases the energy delivered by the automobile is the product of the pull exerted at the drawbar into the distance passed over by the tread of the driving wheel. Thus, the horse-power delivered is equal to the pull upon the dynamometer in pounds, multiplied by the space passed over in one minute by the automobile driving wheel, divided by 33,000. The space passed over is most conveniently found by determining the number of revolutions of the supporting wheel since the latter is of fixed diameter; that is, the determination is

based upon the length of the path traveled rather than by the revolution of the driver.

Fig. 4 is a photograph of the plant with automobile removed, looking toward the dynamometer. Fig. 5 is a partial view of the opposite end showing the traction dynamometer, and Fig. 3 shows the supporting wheels and the friction brake.

While the plant will lend itself to studies of a highly refined character, it is proposed during the present winter to determine the output of power under various conditions of running of a considerable number of typical machines.

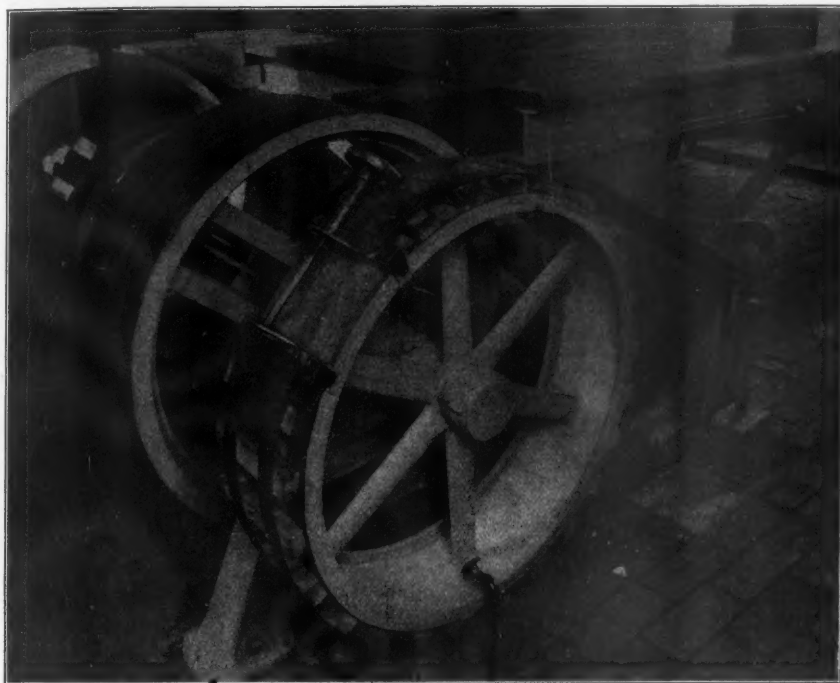


Fig. 3—Driving Wheels and Friction Brake of Testing Plant.

1 and 2. It will be seen that an automobile mounted for testing has its driving wheels carried by the supporting wheels of the plant. These wheels are mounted on an axle which revolves in fixed bearings. The automobile is held in position by a connection with a traction dynamometer which, in Fig. 2, appears at the rear of the machine. A friction brake on the axle of the supporting wheels absorbs the energy delivered by the machine. A motor-driven pressure blower delivers air through adjustable piping for cooling the radiators of steam and gasoline machines and a motor-driven exhauster takes air from a point near the exhaust

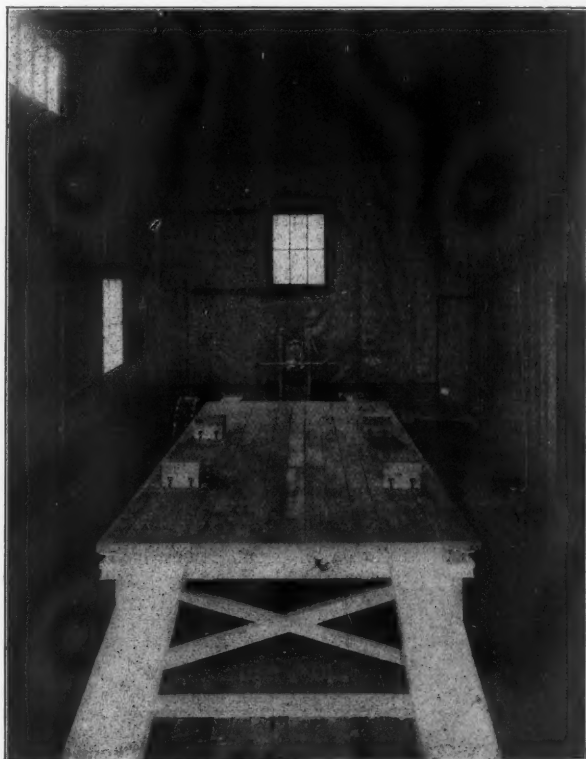


Fig. 4—Mounting Platform of Automobile Testing Plant.



Fig. 5—Dynamometer for Automobile Testing Plant.

The Cost of Locomotive Operation.

XXI.

BY GEORGE R. HENDERSON.

(Continued from page 40.)

UP AND DOWN HILL.

Instead of a continuous slope in one direction only, let us consider a division of 150 miles, with a summit at the middle. This will, perhaps, be nearer to existing cases than the former supposition. The same locomotive will be selected for our calculations, and we will also assume that the down hill trip or portion will be run uniformly at 30 miles an hour. The grade of 1 per cent. will be ample to maintain this velocity without any assistance from the engine—indeed, the brakes will have to be used to prevent the train running away. From this it is apparent that on the downhill part only sufficient coal and water need be used to run the air pump and make up for radiation. The former would require only about 10 cents worth of coal for the 75 miles down grade, and the latter would be the same no matter what the train load; from this it is evident that we can, without sensible error, consider that coal and water will be used on the 75 miles of up-hill only. As both sides are 1 per cent. we can refer largely to table A (see *Railroad Gazette* Jan. 5, page 11) and proceed to construct table E.

TABLE E.

	5	10	15	20	25	30
1. Speed up hill, miles per hr.	5	10	15	20	25	30
2. W't train, tons back tender.	1,450	1,430	1,100	800	560	400
3. Ton-miles per trip.*	217,500	214,500	165,000	120,000	84,000	60,000
4. Run'g time, hrs. bet. trmnls.	17.5	10.0	7.5	6.25	5.5	5.0
5. Actual time, hrs. bet. trmnls.	21.0	12.0	9.0	7.5	6.6	6.0
6. Average speed bet. trmnls.	7.2	12.5	16.7	20.0	22.7	25.0
10. Cost of coal, per trip.....	\$18.75	\$30.00	\$20.25	\$15.00	\$12.00	\$9.37
11. " " water, per trip....	2.80	4.50	3.05	2.25	1.80	2.40
12. " " lubrication, per trip	.50	.50	.50	.50	.50	.50
13. " " supplies, per trip..	.20	.20	.20	.20	.20	.20
14. " " repairs, per trip..	16.50	16.50	13.88	10.85	9.00	7.88
15. Allowance, renewals, pr trip	1.50	1.50	1.50	1.50	1.50	1.50
16. Pay, of engineman per trip.	14.70	10.50	10.50	10.50	10.50	10.50
17. Cost of handling, per trip.	2.00	2.00	2.00	2.00	2.00	2.00
18. Interest allowance, per trip.	2.60	1.70	1.40	1.25	1.16	1.10
20. Cost, train supplies, pr trip	2.25	2.25	2.25	2.25	2.25	2.25
21. Cost, car repairs, per trip..	32.60	32.10	24.80	18.00	12.60	9.00
22. Pay of trainmen, per trip..	16.90	12.08	12.08	12.08	12.08	12.08
23. Cost of movement, per trip	111.30	113.83	92.41	76.38	65.53	58.78
24. Cost, 1,000-ton miles, net..	.51	.53	.56	.64	.78	.98
25. Million ton-miles pr month	6.00	9.05	8.50	6.89	5.20	3.92

*Tons back of tender.

With Reduced Train-loads, Cost and ton-mileage.

	1.02	.86	.87	.89	.93	.96
400 tons	1.66	2.54	3.08	3.46	3.73	3.93
600 "	.78	.67	.69	.71		
	2.48	3.72	4.63	5.19		
800 "	.65	.58	.60	.64		
	3.31	5.08	6.17	6.90		
1,000 "	.58	.52	.56			
	4.15	6.36	7.73			
1,200 "	.54	.50				
	4.98	7.62				
1,400 "	.51	.52				
	5.80	8.90				

Line 1 gives the running speed for the up-grade portion, same as in table A, and of course lines 2 and 3 will be the same as in table A. Line 4, the running time between terminals, will be half of that in table A (75 miles up hill) plus $2\frac{1}{2}$ hours, as at 30 miles per hour that time will be required to come down the last 75 miles from the summit; thus $\frac{30}{2} + 2.5 = 17.5$, etc. In line 5 we

have added 20 per cent., as before, to the values in line 4. The average speed between terminals, line 6, is 150 miles divided by line 5, and we notice that these values are all higher than formerly, except in the last column, which is the same for both.

Lines 7, 8 and 9 need not be extended, as we can take the cost for coal and water at one-half that given in table A, in consequence of considering that steam is required on the 75 miles of up-grade only. Lines 10 and 11 are, therefore, given at one-half the previous values in table A. Lines 12 and 13 follow table A without change, as they are based on engine mileage only. Line 14

is one-half of that in table A plus 75 cents, thus $\frac{31.50}{2} + .75 = 16.50$,

as the tractive effort will be identical for 75 miles (half the distance), and the last 75 miles being run without steam, only one cent a mile will be charged.

Line 15, renewals, being based on engine mileage, will remain unchanged. As the average speeds are now greater, we shall have

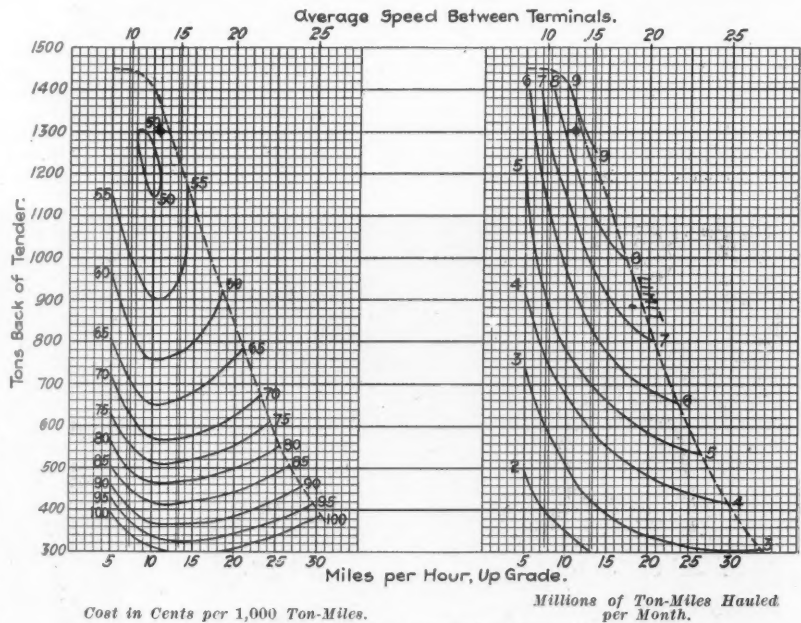
a reduction in the pay of enginemen (line 16) in the first two columns, but after that the amounts will be the same, being based on mileage only. The cost of handling (line 17) will, of course, remain as before. The time of trips being shorter, line 18, interest, will be less, except in the last column, it being computed at 10 cents an hour for the time of trip, plus five hours for lay-over.

Lines 20 and 31, train supplies and car repairs, will remain as before, but line 22, pay of trainmen, will reduce in a manner similar to that of enginemen, and for the same reason. Lines 23, 24 and 25 were computed in the same manner as in table A, and the effect of the 75 miles of down grade is at once apparent in the reduced cost and greater movement per month.

By a process as explained in connection with tables C and D, the lower portion of table E has been calculated, and the results laid off for graphical inspection in Fig. 12. As before, we have our minimum cost at about 10 miles an hour running speed up grade, but while in the previous case this corresponded to an average speed between terminals of 8.3 miles an hour, it now means 12 miles an hour (as shown by the lower speed figures), or an average running time of 15 miles an hour. The cost is 50 cents per 1,000 ton-miles, instead of 70 cents, and this is the lowest possible figure attainable by any combination of speed and load. (This would correspond to about 3 mills per revenue ton-mile if all expenses were included, but no light engine mileage or empty hauls had to be paid for.)

The total movement per engine month is shown by the right-hand diagram. Here the highest possible figure is 9,000,000 ton-miles a month, which is, however, only two-sevenths greater than in the former case. The crossed dot indicates that the best results, considering both cost and movement, can be obtained by loading to 1,300 tons (150 tons less than the full load for the engine) and running up hill at 11 miles an hour, or average speed including 20 per cent. of delays, of 13 miles an hour. Under these conditions the cost would be about 51 cents per 1,000 ton-miles and about 8,500,000 ton-miles (back of tender) could be taken by each engine per month.

The cost of fast freight and stock trains is again apparent. If a train is to average 25 miles an hour we see that the cost will be \$1 per 1,000 ton-miles—double what was possible with slow freights, and only about half as much tonnage could be moved



per month. Again, if engines are loaded, as they in all probability would be, with 1,450 tons, the average speed would be 10 miles an hour, which would ordinarily be considered quite fair; but if a congestion of traffic occurred by diminishing the load 10 per cent., or to 1,300 tons, 1,500,000 ton-miles more could be made a month, and the cost of movement actually decreased. This being the case, there is little to recommend the extreme load for ordinary operation, except for the personal satisfaction of making a paper record and endeavoring to please the "man higher up" who may happen to be so thoroughly imbued with the advantage of a big train load, that the real cost of operation has been overlooked by him.

Undulating Profiles.

It often occurs that a division lies across country, that is, over ridges of hills, and so makes a "saw-tooth" profile. Let us consider 150 miles as before, divided into 10-mile stretches of 1 per cent.

grade up, 1 per cent. down and level; that is, there may be 10 miles of level track, followed by 10 miles up-hill and the same distance down grade, this sequence repeated five times over the division. This will constitute an undulating profile and we should see what effect the level stretches will produce.

By means of the thin sheets, Figs. 7 to 10 (see *Railroad Gazette*, March 31, 1905, page 313), we can determine the coal consumption in connection with Fig. 2, also the maximum speed which different loads can be taken on a level. In a similar manner we will calculate the cost of trips running up-hill at speeds of 5, 10, 15 and 20 miles an hour, with train loads of 800 tons and upwards to the capacity of the engine. We will assume that all down-hill movements are made at 30 miles an hour, and on the levels a speed as great as the train load will permit. When we use the greatest load that can be taken up the 1 per cent. grades at the speeds considered, viz., 1,450, 1,430, 1,100 and 800 tons respectively, we find that the engine can make on a level 32, 33, 37 and 42 miles an hour accordingly. With lighter trains, higher speeds can be obtained. By taking these various factors into account we were able to produce Fig. 13, in which the curves have not been extended to

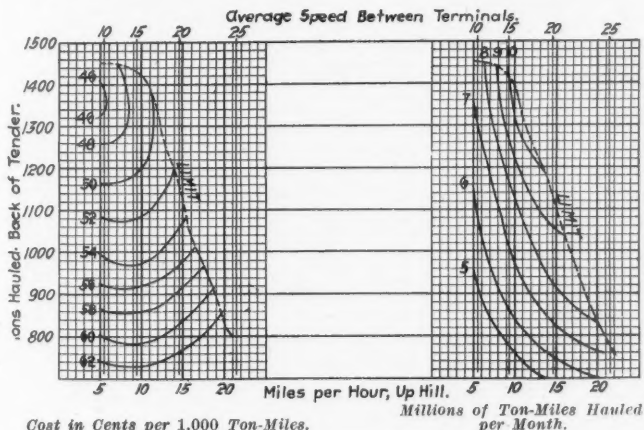


Fig. 13—The Cost of Locomotive Operation.

quite as light trains as in Fig. 12. We are at once struck by the fact that the minimum cost curve (46 cents) is confined to the five miles an hour up-hill line—the average speed between terminals is, however, nearly 10 miles an hour, or a running speed averaging 12 miles an hour, if the lay-over allowance be extinguished. The cost is generally reduced from 3 to 5 cents per 1,000 ton-miles, and the rate of increase for higher speeds is not so great.

The right-hand diagram shows nearly 2,000,000 ton-miles per month more work done for the same up-grade speed and loads, but nearly the same for comparative average speeds, as we should expect. The principal difference is in the wide separation of the schedules of minimum cost and maximum work. In Fig. 12 there is only about two miles an hour difference in speed between these two combinations; in Fig. 13 there is about seven miles difference in average speed, and the variation in cost is about 4 cents instead of 2 cents.

We again see that the most economical rating is not the maximum which the engine can haul on the hills, but is slightly less, perhaps 100 tons. In general the characteristics are similar, for Figs. 11, 12 and 13, but there is sufficient difference to indicate the importance of having a chart made for each operating division, embodying the peculiar physical characteristics of each.

Figs. 12 and 13, indicating that the most economical and also most efficient (capacity) speed is about 12 miles an hour between terminals are corroborated by the recent tests of one of the largest railroads in this country, from the results of which it was found that 12 miles an hour (between terminals) gave the minimum cost per car mile and also the maximum car mileage per engine month. Other roads have lately found the same to be true, though little has been printed on this fact.

(To be continued.)

When there has been a serious accident on the Prussian State Railroads, at the next session of Parliament the Minister of Public Works is sure to be called upon for explanations, and all sorts of suggestions for preventing such disasters are offered by members. Last summer 14 people were killed in a collision, and last December Minister Budde was asked to tell why. His answer indicates that even Prussian discipline does not always secure obedience to orders. "As head of the administration, of course, I made a thorough investigation, which made the causes of the accident clearer than is often possible. A professor teaching train running might have cited this case as an example where an accident on a single-track railroad would not be possible; and when he were

told that in this case seven different persons acted directly against their instructions, he would probably have said that was impossible." He reported that all employees directly or indirectly responsible for the accident had been dismissed from the service, which means a great deal more there than it would here, because the larger number of them must have been members of the corps of railroad employees, who have substantially a life service, as much so as our regular army officers. It is also notable that this announcement was received with applause by the Parliament.

Train Accidents in the United States in December.¹

*rc, 1st, Delaware & Hudson, East Windsor, N. Y., a freight train which had been unexpectedly stopped on account of a hot journal was run into at the rear by a following freight, making a bad wreck. The wreck took fire and a part of it was burnt up. One brakeman was killed.

eq, 1st, Southern Railway, Ramsey, Ind., a freight train was derailed by a broken truck and 13 cars were wrecked. A tramp was killed.

*rc, 2d, Philadelphia & Reading, Annville, Pa., a freight train which had been unexpectedly stopped was run into at the rear by a following freight, making a bad wreck. The wreck took fire and was mostly burnt up. Five trainmen were injured.

dn, 3d, Lehigh Valley road, near Penn Haven, Pa., a freight train consisting of a locomotive and 60 cars became uncontrollable on a steep descending grade and was derailed at a curve. The engine and 15 cars were wrecked.

rc, 5th, St. Louis, Iron Mountain & Southern, Alexandria, La., rear collision of freight trains; one fireman killed and one other trainman injured.

dr, 6th, 3 a.m., St. Louis & San Francisco, Adamsville, Ala., a freight train was derailed by a broken rail near a trestle bridge, and 14 loaded cars fell 60 ft. to the bottom of a ravine. Two men were killed and two injured.

o, 6th, Central of New Jersey, Palinfeld, N. J., the engine of a passenger train running at high speed was badly damaged by the breaking of a side rod. A house near the track was damaged and a boy walking along the street was injured by a stone thrown up by the broken rod.

*bc, 7th, Union Pacific, Rock Springs, Wyo., butting collision between an eastbound passenger train and a westbound freight, wrecking both engines and several cars. The wreck took fire and its combustible portion was burnt up. One engineman, one brakeman, three cooks, two electricians and two mail clerks were killed and eight passengers and 11 employees were injured. The freight train had received an order to wait at Ahsay for four eastbound passenger trains, but waited for only three.

unx, 7th, New York Central & Hudson River, Mott Haven, N. Y., a southbound passenger train was derailed at a switch and three cars were ditched. One of the cars fell against the switch tender's cabin and killed the occupant. Another switch tender was injured.

unx, 7th, Chicago & North-Western, Winfield, Ill., the locomotive of a passenger train was derailed and ditched and the engineman was killed. The fireman and two other persons were injured.

xc, 8th, Hoxie, Ala., an eastbound passenger train of the St. Louis & San Francisco ran into a northbound freight train of the St. Louis, Iron Mountain & Southern at the crossing of the two roads, and one engine and one freight car were wrecked. A man stealing a ride was injured.

dr, 8th, Texas & Pacific, Boyce, La., a passenger train was derailed by a broken rail and the engine was overturned. Three trainmen were injured.

dn, 8th, Atchison, Topeka & Santa Fe, Corona, Cal., a passenger train approaching the crossing of a line of the Southern Pacific was turned on to a diverging track to prevent a collision, and the engine and baggage car were derailed and overturned. The engineman was killed.

o, 8th, Philadelphia & Reading, Pottstown, Pa., the locomotive of a freight train was wrecked by the explosion of its boiler. Four trainmen and three trackmen were injured.

unx, 9th, Wadley & Mount Vernon, Kite, Ga., a mixed train was derailed and one passenger car and five platform cars broke

¹Accidents in which injuries are few or slight and the money loss is apparently small, will, as a rule, be omitted from this list. The official accident record, published by the Interstate Commerce Commission quarterly, is regularly reprinted in the *Railroad Gazette*. The classification of the accidents in the present list is indicated by the use of the following

ABBREVIATIONS.

rc Rear collisions.
bc Butting collisions.
xc Miscellaneous collisions.
dr Derailments; defects of roadway.
eq Derailments; defects of equipment.
dn Derailments; negligence in operating.
unf Derailments; unforeseen obstruction.
unx Derailments; unexplained.
o Miscellaneous accidents.

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more persons.

through a trestle bridge and fell into a river. The conductor and several passengers were injured.

re, 11th, Northern Central, Woodberry, Md., a freight train standing at the station was run into at the rear by a passenger train and eight passengers were injured.

bc, 11th, Atchison, Topeka & Santa Fe, Newkirk, Okla. T., butting collision between an eastbound passenger train and a westbound freight, wrecking both engines and several cars. Three trainmen and several passengers were injured.

bc, 11th, 11 p.m., Kansas City Southern, Cawthorne, Tex., butting collision of freight trains; one trainman was killed and three others were injured.

xc, 12th, Cleveland, Cincinnati, Chicago & St. Louis, Batesville, Ind., a freight train collided with some freight cars which a moment before had been accidentally pushed out of a siding to the main track. The conductor and one brakeman were killed and the engineman was injured.

dr, 12th, Southern Railway, Curls, Ala., a passenger train was derailed by spreading of rails, and two passenger cars fell down a bank and were overturned. Seven passengers were injured.

unx, 12th, 3 a.m., Southern Railway, Littleton, Ala., a train consisting of a locomotive and a caboose was derailed and wrecked and five trainmen were injured; one of them, the engineman, fatally.

xc, 13th, Chicago, Rock Island & Pacific, Waterloo, Iowa, a passenger train ran over a misplaced switch and into some freight cars standing on the side track, making a bad wreck. Three trainmen and several passengers were injured.

dr, 13th, 8 p.m., Gulf, Colorado & Santa Fe, Lyons, Tex., a freight train was derailed by spreading of rails and 15 cars were wrecked. The fireman was killed.

rc, 15th, 4 a.m., Pennsylvania road, Coverts, Pa., rear collision of freight trains, wrecking 12 cars and throwing one locomotive down a bank. One engineman and one brakeman were killed and two other trainmen were injured.

rc, 15th, Pennsylvania road, Coatesville, Pa., an eastbound passenger train ran into the rear of a preceding freight, wrecking the engine and four freight cars. The engineman was injured.

dr, 15th, 1 a.m., Illinois Central, Evansville, Ind., a passenger train being transferred from the I. C. to the L. & N. was derailed at a broken rail and the engine was badly damaged. A brakeman was killed.

unx, 15th, St. Louis, Iron Mountain & Southern, Monroe, La., a freight train was derailed and the engine and two cars were overturned. The fireman was killed.

bc, 16th, Seaboard Air Line, Plymouth, Fla., butting collision between a passenger train and a freight; three trainmen killed and three injured.

xc, 16th, 3 a.m., Philadelphia & Reading, Perkiomen, Pa., collision of engines at a crossing. One fireman killed and one fireman fatally injured.

bc, 17th, El Paso & Southwestern, El Paso, Tex., butting collision of freight trains, wrecking the engines and 13 cars. Three trainmen were injured.

rc, 19th, Baltimore & Ohio, Hedgeville, W. Va., a freight train standing at the station was run into by a following freight. The fireman jumped off and was struck and killed by a passing passenger train, and a brakeman riding on the engine jumped off and was killed by being struck by pieces of the wreckage.

bc, 19th, Chicago, Rock Island & Pacific, Waurika, Okla., butting collision of freight trains, making a bad wreck. One conductor killed.

txc, 19th, New York Central & Hudson River, 106th street, New York City, a northbound passenger train of the New York, New Haven & Hartford running through a crossover from track No. 4 to track No. 3 was run into at the side by a passenger train of the New York Central, also northbound, on track No. 3, the N. Y. C. train having run past distant and home signals set against it. One car of the New Haven train was overturned; one passenger killed, 15 injured. This accident was reported in the *Railroad Gazette* of Dec. 20.

unf, 19th, 3 a.m., Atchison, Topeka & Santa Fe, Lang, Kansas, passenger train No. 17 was derailed at a point where the track had been weakened by the malicious removal of spikes, and the engine and several cars were wrecked. The engineman and express messenger were killed and six other persons were injured.

o, 19th, Philadelphia & Reading, Birdsboro, Pa., the locomotive of a freight train was wrecked by the explosion of its boiler, and the engineman, fireman and one brakeman were killed.

xc, 20th, Illinois Central, Paducah Junction, Ky., a freight train descending a grade broke in two and the rear portion afterward ran into the forward one, wrecking four cars. A man stealing a ride was killed.

dn, 21st, Pittsburg, Cincinnati, Chicago & St. Louis, Hartsdale, Ind., fast freight train No. 87, first section, was derailed at a misplaced switch and the engine and many cars were wrecked. The engineman and three other trainmen in the engine were injured.

bc, 22d, Southern Railway, Linn, Ala., butting collision of

freight trains, wrecking both engines and 16 cars, many of which fell down a bank. One engineman was injured and one tramp was killed.

xc, 22d, Philadelphia & Reading, Perkiomen Junction, Pa., collision between a milk train and a freight train; three trainmen killed, two injured.

*†22d, Illinois Central, Holly Springs, Miss., northbound passenger train No. 6 was derailed at a loose joint, and six cars fell down a bank. The baggage car and smoking car took fire and were burnt up. One passenger was killed and one trainman and seven passengers were injured. It is believed that the rail joint had been maliciously loosened.

o, 22d, Lehigh Valley, Van Etten, N. Y., the locomotive of a freight train was wrecked by the explosion of its boiler; two employees killed, five injured.

eq, 23d, Lehigh Valley, Catasauqua, Pa., a freight train was derailed by a brake-beam which became loose and fell on the track, and a derailed car ran against the station building, tearing down a part of it. The telegraph operator in the station was killed.

unx, 24th, Denver & Rio Grande, Durango, Colo., a passenger train was derailed and one passenger car fell down a bank. Two trainmen and 15 passengers were injured. John Acord, a passenger, prevented the burning of the wreck by carrying a red-hot stove out of a car to a place of safety.

†rc, 25th, Alabama & Vicksburg, Chunkey, Miss., a passenger train standing at the station was run into at the rear by a freight, and one passenger and the fireman were killed.

o, 25th, New York, Susquehanna & Western, Passaic, N. J., the locomotive of a freight train was wrecked by the explosion of its boiler and two men were scalded, one of them fatally.

bc, 26th, Albany & Hudson (Electric), Kinderhook, N. Y., butting collision of passenger cars; three employees and two passengers injured. One of the cars had failed to stop at an appointed meeting station.

*bc, 27th, Pittsburg, Cincinnati, Chicago & St. Louis, Cincinnati, Ohio, butting collision of freight trains, making a bad wreck, which took fire and was partly burnt up. One trainman was killed.

bc, 27th, Central Vermont, South Royalton, Vermont, butting collision between a northbound passenger train and a southbound freight train, wrecking both engines and several cars. Two trainmen were injured. It is said that the passenger train had run a short distance beyond the station where it should have met the freight, because the engineman, seeing a way freight train standing on the side track, assumed that it was the through train for which he was on the lookout.

bc, 27th, Southern Railway, Flovilla, Ga., butting collision between passenger train No. 15 and a freight train; six passengers and one trainman injured.

unx, 27th, Gainesville Midland, Bethlehem, Ga., a passenger train was derailed and all of the cars were overturned and fell down a bank. Two passengers were injured.

bc, 28th, New York, New Haven & Hartford, New Britain, Conn., butting collision between a freight train and a work train; one trainman and nine laborers injured.

xc, 28th, Pennsylvania road, Aspinwall, Pa., an eastbound train consisting of an engine and two freight cars ran over a misplaced switch and collided with another train consisting of an engine and a caboose, overturning one of the engines and fouling the westbound main track. A westbound passenger train coming along a moment afterward ran into the wreck and every car of the passenger train was knocked off the rails. Two passengers and two trainmen were injured.

unx, 28th, New York & Ottawa, Bay Pond, N. Y., a southbound passenger train was derailed and four cars fell into the ditch and were overturned. Seven persons were injured.

unx, 29th, 4 a.m., Baltimore & Ohio, Baltimore, Md., a car in a freight train passing through the tunnel, not far from the Camden station, was derailed and ditched, and ruptured a compressed gas pipe. The gas rushing out of the broken pipe was ignited from a lamp, and the caboose and cars of the train and a signal cabin were damaged.

*unx, 29th, 1 a.m., Chicago & Erie, Disko, Ind., a freight train was derailed and the engine and 10 loaded refrigerator cars were ditched. The wreck took fire and was partly burnt up. Three trainmen were killed.

xc, 30th, Mississippi Central, Prentiss, Miss., a westbound passenger train ran over a misplaced switch and into the head of a freight train standing on a side track. The engineman and one passenger were injured.

unx, 31st, 2 a. m., Pennsylvania road, Lock Haven, Pa., a passenger train was derailed and several cars were overturned. The fireman was killed and the engineman and several passengers were injured.

unx, 31st, Atchison, Topeka & Santa Fe, Kendrick, Okla., a freight train was derailed on a bridge and the tender and all of the 14 cars of the train broke through and fell to the stream below. The fireman went down on the tender and was killed.

GENERAL NEWS SECTION

NOTES.

One of the Union Pacific gasoline motor cars has been sent to Los Angeles.

The electric train staff has been put in use on the Louisville & Nashville between Nashville and West Nashville.

At Savannah, Ga., three ferry boats and tugs have been fined \$200 each by the Collector of the port for failure to carry fog horns, as required by law.

The State Railroad Commission of Minnesota has sent to the railroads of the state new freight tariffs, making large reductions; and calling on the roads to show cause why the reduced rates should not be adopted.

William A. Humphrey, Chief of Police of the New York Central & Hudson River Railroad, reports that during the year 1905 his department made 3,944 arrests. The number of convictions secured was 3,572; stolen property recovered, \$13,793. Among the persons arrested were 31 pickpockets.

Lake Erie being open, in consequence of the unprecedented warm weather of the past month, a large lake steamer, the Stanton, started from Buffalo on January 19, according to a press despatch from that city, to go to Cleveland for coal. No vessel man can remember a boat clearing from Buffalo in January before.

The three grain dealers of Louisville, Ky., who were found by the Interstate Commerce Commission to be guilty of fraudulent practices in obtaining reduced freight rates on grain from Louisville to southeastern points, and who were indicted by the grand jury, have pleaded guilty and have been fined \$1,025 each.

Following the discovery of one or more counterfeit certificates of stock of the Norfolk & Western, the officers of the Philadelphia & Erie, and, it is said, of other companies controlled by the Pennsylvania, have decided to issue new certificates of the stocks of the company and to call in and destroy all those now in use.

A passenger who rides daily in the New York Subway, southward in the morning and northward in the evening, reports to the New York *Evening Post* that the average time made by the express trains on which he traveled (not the average of all expresses) for seven days, between 116th street and Fulton street, was, in the morning, 39 minutes, and in the evening about 36 minutes. These figures he compares with "Fifteen minutes to Harlem," the claim which was made for the subway before it was built. Trains have made the distance in 15 minutes under favorable circumstances.

"The scalpers have been driven out of Texas." This is the assertion of Colonel T. J. Anderson, General Passenger Agent of the Southern Pacific, as reported in the *Galveston News*. It appears that the governments of the principal cities have taken action to regulate and repress illegal and irregular ticket brokerage, and that an injunction has been issued forbidding the sale of signed return tickets by scalpers. Colonel Anderson says that the railroads will now feel free to be more liberal in granting excursion rates.

The State Railroad Commission of Georgia has issued an order that, beginning February 19, the Southern Railway, the Central of Georgia, and the Atlantic Coast Line must make reductions of about 10 per cent. in their local freight rates; and the companies are forbidden to try to evade this order by making changes in classification. It is also said that all freight rates in force now in the state which are lower than those which have been prescribed by the state will be adopted by the commission, and the roads forbidden to raise them.

According to the Louisville *Courier-Journal* a rural telephone line was utilized recently on the Southern Railway, near New Albany, Ind., to prevent a collision of freight trains. An eastbound freight ran past a train order signal at a small station. The train dispatcher was at once informed, but was unable to reach the opposing train by telegraph. But somebody thought of a telephone line connecting with a farmhouse several miles out on the road, and a member of the farmer's household was informed of the trouble and he (or she) ran out on to the track and flagged the eastbound train.

E. S. Halstead & Co., of New York, have secured a verdict of \$2,200 in the state Supreme Court against the Postal Telegraph Company for an error in a telegram, which is said to have cost them the sum named. The message as sent, giving the price of

cloth, read two-eighty and three-eighty, meaning 2.80 cents and 3.80 cents per yard. As delivered, the message read two-eighth and three-eighth, which was taken by Halstead & Co. to mean 2½ and 3¼. As will be understood by those familiar with the Morse alphabet, a sender, to make this mistake, would need only to shorten by about one-tenth of a second the space between the two dots in the middle of the letter y.

The New York State Court of Appeals has decided in favor of the state the contention made by the New York Central that it was not liable for state taxation on the great number of freight cars that are outside the state part of the time. The assessment in question was that made annually upon corporations on that portion of capital stock employed in this state. The annual tax on this part of the company's rolling stock involves thousands of dollars, and the decision of the Court of Appeals, which sustained that of the Appellate Division in upholding the right of the state to tax this rolling stock, will be appealed by the railroad company to the United States Supreme Court on the ground that the capital embraced in these cars is not to be held to be capital employed in this state.

Mr. W. M. Prall, Commissioner of the Pittsburg Car Service Association, has been appointed Manager of the Cleveland Car Service Association also, and, according to the *Pittsburg Gazette*, is to manage both associations. It is said that the 30-hour average plan, which is in use at Cleveland, will be done away with by Mr. Prall. This plan permits consignees 30 hours in which to unload a car, after which car service charges are imposed. It is said to have proved unsatisfactory at Pittsburg district in 1903. The weakness of the plan is the fact that if 100 cars are received in a day and 95 are unloaded in 24 hours, the consignee saves 95 times six hours, which is cumulative and gives him 570 additional hours on the five remaining cars. This cumulative time on daily receipts of cars caused the congestion in 1903.

The Michigan State Board of Tax Commissioners has fixed the valuation of railroad property in the state, for the year 1905, at \$207,080,000, which is \$10,285,000 greater than the figure for 1904, but about \$14,000,000 less than in 1903. The law provides that the rate of the tax on railroad property shall be the average rate paid on all other classes of property during the previous year. According to this scheme, the rate during 1904 and 1903 was \$16.92 upon every \$1,000 of assessed valuation. The last legislature, however, gave the Board authority to add \$300,000,000 to the assessed valuation of other than railroad property because it was held, after a thorough investigation, that the assessment of this property by the state assessors had been smaller than the true value by this amount. The addition of this sum does not increase the amount of taxes paid on other property, but lowers the average rate of taxation from \$17.40 to \$14.61. The amount of taxes for which the railroads are liable is, therefore, \$3,020,000. The Attorney-General, it is said, will begin action to set aside the addition of the \$300,000,000 referred to above, on the ground that the law giving the Board this right is unconstitutional and void, since it gives that body arbitrary power to ignore the sworn statements made by other assessing officers.

Proposed Block System Law in Massachusetts.

A bill has been presented in the Massachusetts legislature to require "every railroad company operating passenger cars" in the state to equip its line with a block signal system to be approved by the railroad commissioners; and to have the same in operation by, or before, a date yet to be specified.

More American Steel Cars for the London Underground.

The American Car & Foundry Company has been awarded a contract by the Underground Electric Railways Company of London for 150 steel cars to be used on the Charing Cross, Euston & Hampstead division of the extensive system in and around London in which the late Charles T. Yerkes was a dominant factor. The contract calls for 60 motor cars and 90 trailers. It is the most important contract of this sort ever awarded an American firm, and is the second one obtained by the American Car & Foundry Company, which received, some eighteen months ago, a contract for 100 steel cars for the Baker Street & Waterloo Railway, operated by the same London company. Most of these cars are already in use. The cars just ordered will be built at the American Car & Foundry Company's new plant at Trafford Park, near Manchester, where about 500 men are employed. L. T. Canfield, formerly superintendent of the company's steel car shops at Berwick, Pa., is resident manager. The steel and other materials to be used will be

shipped from this side. Delivery of the cars will, according to the contract, be completed this year.

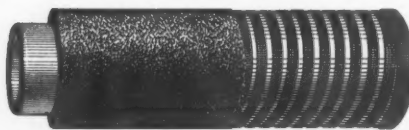
American interests have secured practically all the principal contracts in connection with the London underground railway system, which are estimated to represent an aggregate of almost \$20,000,000. The Westinghouse company undertook the complete work of building and equipping the large power station at Chelsea, a suburb of London. This is the largest structure of its kind in England and cost more than \$6,000,000. The motors for the cars were ordered from the British Thomson-Houston Company, which is controlled by the General Electric Company. A contract worth upwards of \$2,000,000 was placed for the Otis elevators. The car contracts already let the American Car & Foundry Company represent a value of almost \$2,500,000.

English Street Railroads.

In the United Kingdom there are now 2,117 route miles of tramways representing a capital outlay of \$78,000 per mile of single track. Per annum, according to the statistics just officially issued for the year ended March, 1905, about 2,069 millions of passengers travel at an average fare of 2.2 cents. The working expenses amount to 66.19 per cent. of the gross receipts. Of the 320 undertakings, 174 are municipally controlled, and 146 belong to private companies. All the lines are operated on the overhead trolley direct current principle, excepting two which use underground conduits, and one surface contact. Several lines are now being equipped on the last-mentioned method.

Wood Pipe.

The Wyckoff wood pipe, shown in the accompanying illustration, made by A. Wyckoff & Son Co., Elmira, N. Y., is specially adapted for conveying water and is used for this purpose by a number of railroads in preference to iron pipe. It is claimed by the makers that this pipe is cheaper in first cost than iron pipe, that it is easier to handle and that it will not rust or corrode, as it is not affected by sulphur or other impurities. It is also claimed that it is cheaper to lay and that it is less liable to freeze, and that it lasts longer than iron pipe. All pipe up to 6 in. in diameter is bored out of the solid log, and all pipe from 6 in. up to 20 in. in diameter is made of white pine staves in lengths of from 4 ft. to 8 ft. joined by regular tenon and socket



The Wyckoff Reinforced Wood Pipe.

joints. It is also tightly wound on the outside with steel hoops or wire, and is then coated with a mixture of asphaltum and pitch which protects the steel bands against corrosion. The hoops are further protected from corrosion by being coated with a preparation of cement before they are wound on the pipe. These pipes are made to stand any pressure up to 160 lbs. per sq. in. Elbows, tees, bends, crosses, reducers, plugs, tubes, nipples, and special pump and valve connections are also made to go with these pipes. Pipes made of hard maple in the same manner as the pine pipes will convey culm and other material without injury to the pipe, as the action of the culm on the interior of the pipe produces a surface as smooth as glass, which is not injured by grit or other material in the culm. Round and coated wood pipe is also made by the Wyckoff Co., in the same manner as the strengthened pipe, except that it is not wound with steel hoops. This pipe is largely used for underground work where the pressure is not great. Among some of the railroads which are now using the Wyckoff wood pipe are the Chicago, Milwaukee & St. Paul, the Pennsylvania, the Erie and the Lehigh Valley.

A Falling Off in Train Robberies.

The *Express Gazette* continues its record of the doings of train robbers and stage robbers, and for the year 1905 shows only about half as many attacks on trains as in 1904. The tables show, for the last eleven years of the 19th century (1890-1900 inclusive) an average of 26 "hold-ups" a year; but since then a much lower rate, as follows:

"Crimes of the Rail" in the United States.					
1890.....	12	1894.....	34	1898.....	28
1891.....	16	1895.....	49	1899.....	15
1892.....	16	1896.....	28	1900.....	29
1893.....	33	1897.....	30	1901.....	16
				1902.....	22
				1903.....	13
				1904.....	13
				1905.....	7

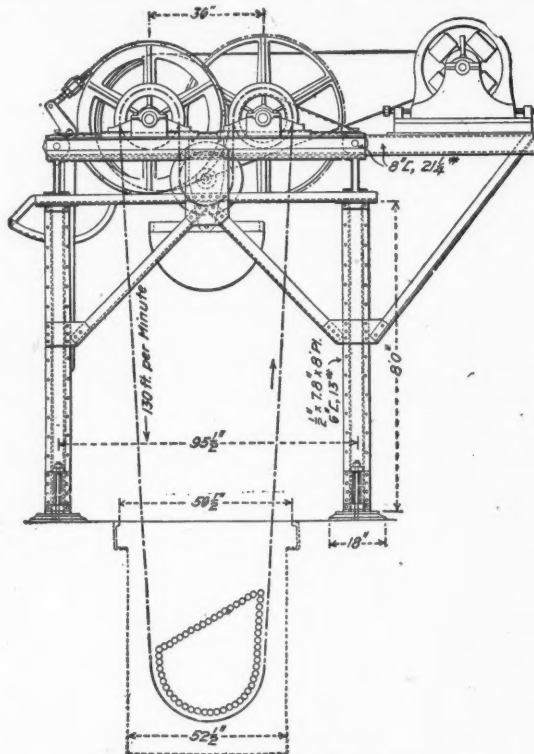
Total number of trains "held up" in 16 years..... 361
Total number of persons killed..... 103
Total number of persons injured—shot..... 113

Record for 1904 and 1905.

	1904	1905
Total number of train "hold-ups".....	13	7
Number of stage robberies.....	4	6
" " passengers and trainmen killed.....	3	1
" " passengers and trainmen shot.....	2	1
" " robbers killed.....	1	0
" " robbers shot.....	1	0

A New Flue Cleaning Machine.

A new type of flue cleaning machine for which many advantages are claimed is illustrated herewith. It consists of a steel framework over a concrete pit built under the floor of the shop and partially filled with water. The flues, while being cleaned, are suspended in the water by two wide-faced case-hardened, wrought-iron chains, forming continuous loops in which the flues roll over and over upon themselves as the chains are driven. All gearing is overhead and driven by a direct-connected motor. To keep the flues in position, fenders are provided in the pit, and are adjustable to flues from 8 to 20 ft. long. The rear chain is supported by a traverse carriage, which is moved toward or away from the front chain by screws driven by the main driving motor, thus adjusting the chains to the length of flues handled. The flues may be raised or lowered by means of an idler over which the driving chain passes and which, by alternate raising and lowering, correspondingly lengthens or shortens the suspending chain. By this arrangement flues are raised by the machine itself independent of the crane service of the shop. There are tracks on each side of the tank upon which a small push car is run. Flues to be cleaned are brought over the pit on a push



The Ryerson Flue Cleaning Machine.

car, lifted from the car by the chains, the car removed, the flues lowered into the pit and the machine started.

The machine illustrated has a capacity for 500 2½-in. tubes at one time. To place the tubes in position to lower requires about 4 minutes and the only labor required is that to push the car in position. To lower the flues ready for rattling requires one man one minute. The actual time of rattling is about the same on this machine as in the barrel form of rattler, but as this machine will take five or six times as many flues as the ordinary rattler, the cost to handle them is reduced to less than 4 cents a hundred. Another great advantage is the absence of noise, the rattling taking place under water, which makes the machine practically noiseless. Furthermore, the water washes out the soot and dirt from the inside of the tubes at the same time that the scale and other material is being removed from the outside of the tube. The propelling chain moves at the rate of about 130 f. p. m. A 20-h.p. direct-connected motor is used to drive the machine.

Some of the largest roads are using these machines, among them the Santa Fe and Northern Pacific. They are sold by Joseph T. Ryerson & Son, Chicago, who own the patents.

Two New Passenger Ferryboats for the Long Island.

The Long Island recently ordered two ferryboats from the Harlan & Hollingsworth Co., Wilmington, Del. The contract calls for delivery within a period of seven months. The boats will be similar in type to those now in use on the North river by the Pennsylvania. They will be 203 ft. long over all by 65 ft. wide over guards. The depth from the base line to the top of the deck beams at the center will be 17 ft. 6 in. The hulls are to be of steel with

seven transverse bulkheads, two longitudinal bulkheads and eight sub-bulkheads subdividing the hull into 20 water-tight compartments. This arrangement of bulkheads will provide a greater factor of safety to the public than the average ferryboat, which has but six compartments. The center of the horse gangway housings, together with the interior walls of the cabins, will be entirely of steel. The outboard wall will be of the usual construction. The decks as far as possible will be of steel. The engine equipment will consist of two fore and aft compound engines with cylinders 18 in. and 38 in. by 28 in. Almy water tube boilers are to be used. The boats will be lighted by electricity and will be equipped with a full complement of lifeboats, liferafts and life-preservers. This equipment will be double that required by the United States Government. The Long Island has recently adopted the Keystone of the Pennsylvania as an emblem for its stacks. The stacks of the new boats will be decorated with the keystone on a blue field with a white border, with the words Long Island in white letters across the face.

Bids for Building Railroads in the Philippines.

The bids recently opened at Washington for building railroads in the Philippine Islands were as follows: A syndicate composed of Cornelius Vanderbilt, J. G. White & Co., of New York; Charles M. Swift, Detroit; William Salomon & Co., H. R. Wilson, Heidelberg, Ickelheimer & Co., and the International Banking Co., all of New York, for building 100 miles on the Island of Negros, 100 miles on Panay and 95 miles on Cebu, at an estimated cost of \$10,000,000. The bid provides for a full guarantee on 4 per cent. bonds for 30 years on 95 per cent. of the cost of construction. If this bid is accepted the work is to be done by J. G. White & Co. The other bid was from Speyer & Co., of New York, for building lines in southern Luzon, from Manila to Batangas, with branches to Santa Cruz and Lucena; Pasacao to Legaspi and Tobaco, and Manila to Cavite and Naic, 29 miles. In northern Luzon Speyer & Co. propose to build 86 miles of branch lines to be operated in connection with the existing railroad from Manila to Dagupan, also a line from the latter place to Camp Number One, an additional 25 miles. They propose to build all the above lines without the government guarantee. A second bid has been submitted by the same people for building a line from Dagupan to Laoag, conditional upon the acceptance of the former bid. On the latter they ask for the full guarantee. Speyer & Co. propose to operate the new lines in connection with the present railroad in Luzon, making an aggregate length of 208 miles. There were no bids submitted for the railroads on the islands of Leyte and Samar. The awards will probably be made next week.

Mr. L. E. Bennett, who made the preliminary survey for J. G. White & Co., says that on the Island of Panay construction work will be easy, and that from Iloilo to Capiz the cost will be about \$35,000 a mile, this high estimate being due to the necessity of providing against great floods. The country is rich, but at present is mostly unproductive because of the lack of transportation. On the Island of Negros the route of the proposed railroad is 130 miles long, through a rich sugar country. Its line is from Jumaymayalam on the west coast to Escalante on the northeast. Danao, the port of Escalante, will make an excellent harbor when the bar has been dredged from the mouth, and should provide anchorage for ten large steamers.

The Island of Negros is very largely of volcanic formation, and it is the volcanic ash in the composition of the soil which accounts for the productiveness of the sugar plantations. It is estimated that once the railroad is established the sugar output may be increased to 400,000 tons, while the present output is less than 80,000 tons. In the highlands of the island there are thousands of acres of timberland on which grow a great variety of timber. At present this timber is quite unavailable because of difficulties of transportation. It is planned to build many spurs from the main line of the road tapping these timber lands.

The conditions which obtain on the islands of Panay and Negros are practically duplicated on Cebu, so far as railroad construction is concerned. This road will be about 70 miles long between the main terminals. Cebu, the main city on the island is on the west coast, and Argoa, a cable port, is on the east coast.

The White firm has been carrying on big engineering operations throughout the archipelago, having had the contracts for the harbor improvements at Iloilo and Cebu. It was the builder of the Manila electric railways and has a trained force of native foremen and workmen, and will be able to work rapidly.

London Subway.

The London County Council has completed its subway, which will enable a through service of single-deck electric cars to be run between the Strand and Islington. This is an important section forming part of the scheme for connecting the tramway system of North London with that on the South Side, which scheme, it may be remembered, is still held back by the decision of the House of Lords not to allow electric cars to run along the embankment and

over the Thames bridges to the present South Side terminus. The construction of this shallow subway has followed the Boston and Budapest subways as models. At one point it is only 3 ft. below the street surface, but at another the line runs in deep level cast-iron tubes which dip to a depth of 31 ft. in order to avoid sewers. The only stations are at points where the tube rises to the surface. The subway has cost about \$1,400,000 to build. On each side it has pipe subways for gas, water and electric mains. At a considerable depth beneath it the Great Northern & Piccadilly electric tube line is being built. The electric service will be opened to the public about February 1. The conduit method is adopted, as in all other London County Council tramways so far built.

Recent Changes in the New York City Bridge Department.

Bridge Commissioner Stevenson has appointed Kingsley L. Martin, hitherto assistant engineer of the Williamsburg Bridge, engineer in charge of the Brooklyn and Williamsburg bridges at a salary of \$5,000 a year. Mr. Martin is a son of C. C. Martin, who was Chief Engineer and Superintendent of the Brooklyn Bridge from 1870 until his death, in 1905. Archibald McLean, who has been in charge of the Brooklyn Bridge, has been made an assistant to Mr. Martin, but retains his \$5,000 a year salary. Olaf M. Kelly, formerly assistant engineer of the Williamsburg Bridge, will have charge of that structure under the superintendence of Mr. Martin. These changes have been made by Commissioner Stevenson to secure better traffic conditions on the Brooklyn and Williamsburg bridges.

As we go to press it is announced that Commissioner Stevenson has appointed Colin M. Ingersoll, Jr., chief engineer of the department, to succeed Mr. O. F. Nichols, who is made Consulting Engineer. Mr. Ingersoll is now Commissioner of Real Estate of the New York, New Haven & Hartford, and until recently was Chief Engineer of that road.

Bond Issues in 1905.

According to the *Wall Street Journal*, the total amount of corporation bonds issued and sold in the New York market in 1905 was \$1,130,000,000. Of this large total, the greater part came from a few corporations. The following is a list of total bond issues by railroad companies that sold \$15,000,000 or more: Pennsylvania, \$115,000,000; Southern Pacific, \$105,000,000; Western Pacific, \$50,000,000; New Haven, \$40,000,000; Oregon Short Line, \$40,000,000; Atchison, \$32,000,000; C., H. & D., \$31,000,000; Rock Island, \$25,800,000; Missouri Pacific, \$25,000,000; C., B. & Q., \$23,859,000; New York Central, \$23,000,000; Colorado & Southern, \$17,000,000; total, \$537,659,000. These 12 railroad corporations supplied almost 50 per cent. of the total new corporation underwriting in Wall street in 1905. In the lists, no allowance is made for refunding, for none should be made in most cases. Straight underwriting is generally involved, whether the money is used for refunding or not. In the C., H. & D. and the Rock Island items all the bonds of all subsidiary companies are grouped to make the total.

Manufacturing and Business.

James L. Pilling is now with the Railway Appliances Company, Chicago. He will receive inquiries relative to improved compressed air locomotive turntable devices; hoisting engines, both portable and stationary, for all purposes, all of which are equipped with the Pilling improved engine.

The Robins Conveying Belt Co., New York, has recently opened an office in the Frick Building, Pittsburg, Pa. G. R. Delamater, Resident Engineer for the company, is in charge of the office and is prepared to receive inquiries from the vicinity of Pittsburg relating to conveying and hoisting machinery.

The J. A. Fay & Egan Co., Cincinnati, Ohio, maker of wood working machinery, is distributing a handsome calendar. The upper part contains an illustration of the company's works as well as reproductions of the medals awarded to the company for its wood working machines at the various expositions both in this country and in Europe.

The Sullivan Machinery Company, Chicago, has appointed H. T. Walsh Manager for the Pacific Coast, with headquarters with Henshaw, Bulkley & Co., San Francisco. Mr. Walsh has had an extended experience with mining equipment, having represented the Sullivan Machinery Co. in the Rocky Mountain region for a number of years. Henshaw, Bulkley & Co., who have been for a long time the agents of this company, will continue to carry a stock of Sullivan rock drills and compressors.

The Chester B. Albree Iron Works, established in Allegheny, Pa., in 1885, maker of bridge railings and ornamental iron work for railroads and buildings, and also maker of the Pittsburg pneumatic riveters, has been recently incorporated under a Pennsylvania charter. Additional capital and the erection of a large addition to the works on adjoining land, together with a new equipment of machine tools, will enable the new company, which will be called the Chester B. Albree Iron Works Company, to continue the old lines of work to much greater advantage and to take up the manu-

facture of the "Inertia Valve Pneumatic Tools," invented by Chester B. Albee, which the old company has spent three years in perfecting.

The Otis Elevator Company, maker of the escalator, states that a careful count made at Macy's department store, New York, of the handling of customers from one floor to another during the recent holiday season showed that the escalator took, on an average, more people from the first floor than all of the elevators in the entire building. These facts are interesting inasmuch as the elevators in the Macy store occupy 25 times the aisle space and many times the floor space occupied by the escalator.

The Vulcan Iron Works, Wilkes-Barre, Pa., have just completed three freight locomotives, of the mogul type, two for shipment to Cuba and one for shipment to Louisiana. They have also just built one six-wheel combination freight and passenger locomotive for shipment to Salaverry, Peru, and have shipped two oil-burning locomotives for the Pacific coast, this being the first consignment of an order for six engines for that section. Three locomotives have also just been shipped to the Bethlehem Steel Co. at their mines at Juraqua, Cuba. These will be used for switching around the mines of the Juraqua Iron Company.

What is claimed to be one of the largest single orders for machine tools ever given at one time by a single company was recently given by the Allis-Chalmers Company, of Milwaukee, to cover a portion of the equipment for the new extensions to its West Allis Works, now under construction. Forty-two machine tools of extra heavy pattern, designed especially for use with high-speed steels, and driven by Allis-Chalmers motors, were ordered from several of the most prominent builders of machine tools in the country (Niles-Bement-Pond Company, Wm. Sellers & Company, Inc.; Detrick & Harvey Machine Co., Manning, Maxwell & Moore, etc.). The combined weight of these machines, without motors, is about 4,282,000 lbs., or 2,141 tons. About 75 Allis-Chalmers motors of various sizes and aggregating a total of 1,200 h.p., will be employed to drive these machines. In addition to the order for machine tools, 34 electric traveling cranes were ordered at the same time from Pawling & Harnischfeger. The combined weights of the cranes ordered is approximately 940 tons.

OBITUARY NOTICES.

Mr. Henry V. Miller, inventor of the Miller block signal, which he was engaged in promoting, and who at one time was Superintendent of Telegraph of the Chicago & Alton, died in Chicago December 27, last. He was born in Marion, Ohio, Feb. 14, 1848.

Mr. George Foot, Resident Engineer of the Mexican Railway, died at Mexico City on January 17 at the age of 74. Mr. Foot was a member of the British Society of Civil Engineers and was at one time General Manager of the Vera Cruz Railroad.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Colorado & Southern.—A. D. Parker, who is now Vice-President in charge of operating, traffic and auditing of the Colorado & Southern, is a graduate of Racine College, having taken his B. A. degree in 1879 and an M. A. in 1882. He began railroad work in 1883 on the Denver & Rio Grande as a section laborer. After serving some time in the shops, he became, in 1884, a clerk in the Auditor's office, advancing during the next nine years through different grades to the position of chief clerk to the Auditor. In 1893 he was appointed Auditor during the receivership of the Union Pacific, Denver & Gulf. The next year his jurisdiction was extended over the Denver, Leadville & Gunnison. In 1899 these roads were reorganized under their present name of the Colorado & Southern, and Mr. Parker became General Auditor. He was elected also Second Vice-President in October, 1905, and in December was relieved of his duties of General Auditor and was given the authority he now exercises.

Denver, Enid & Gulf.—J. L. Soule has been elected Secretary and O. J. Fleming has been elected Treasurer, succeeding H. S. Ames, Secretary and Treasurer, resigned.

Grand Trunk Pacific.—H. J. Symington has been appointed Solicitor.

Pittsburg & Lake Erie.—The jurisdiction of E. V. W. Rossiter, John Carstensen and G. J. Grammer, Vice-Presidents, and D. W. Pardee, Secretary, of the Lake Shore & Michigan Southern and other New York Central lines, has been extended over the P. & L. E. J. G. Robinson, heretofore Secretary, is now Assistant Secretary.

Union Pacific.—J. N. Baldwin, General Counsel for Nebraska and Iowa, has been appointed General Solicitor, succeeding W. R. Kelly, resigned.

Wabash Pittsburg Terminal.—W. M. Bonar, Assistant Secretary and Auditor, has resigned.

Operating Officers.

Chicago, Cincinnati & Louisville.—R. P. Dalton, Superintendent, has been appointed General Superintendent.

Chicago, St. Paul, Minneapolis & Omaha.—J. W. Koopman, chief clerk to the Superintendent of the Nebraska division, has been appointed Assistant to the General Superintendent, succeeding D. C. Morgan, who, as announced last week, has been appointed by the Minnesota R. R. Commission to take charge of railroad valuation in that state.

Hocking Valley.—Arthur Pearce, chief clerk to the General Superintendent, has been appointed to the new position of Assistant to the Superintendent of car service.

Pittsburg, Cincinnati, Chicago & St. Louis.—Nettleton Neff, recently appointed Superintendent of the Richmond division, graduated

from Harvard in 1891. The same year he entered railroad service as assistant on an engineering corps on the Pennsylvania Lines West of Pittsburg. In 1895 he was appointed Assistant Engineer of the Erie & Ashtabula, and the next year was transferred to the Cleveland & Pittsburg. In 1897 he went to the Western division of the Fort Wayne with the same title. In 1898 he enlisted in the First Volunteer Cavalry, and when that regiment was mustered out, was temporarily given special work under the direction of the General Manager of the Lines



Nettleton Neff.

West. In 1899 he became Engineer of Maintenance of Way of the Indianapolis division, being transferred in 1901 to the Chicago Terminal division, where he remained until his recent appointment.

Rio Grande Western.—F. S. Elliott, hitherto Assistant Superintendent of the Great Northern, at Everett, Wash., has been appointed to the new position of Superintendent of the Rio Grande Western.

Union & Glenn Springs.—P. J. Welles, General Manager, has resigned.

Traffic Officers.

Chicago & North-Western.—S. F. Miller, Assistant General Freight Agent at Chicago, has been transferred to Omaha, succeeding J. A. Kuhn, resigned, to engage in private business. H. W. Beyers and J. S. Talbot have been appointed Assistant General Freight Agents at Chicago, succeeding Mr. Miller and T. S. Rattel, assigned to other duties.

Cleveland, Cincinnati, Chicago & St. Louis.—W. G. Pennell, General Agent of the New York Central Lines at Columbus, Ohio, has been appointed Assistant General Freight Agent of the C., C. & St. L. at Louisville, Ky., succeeding H. F. Frost, deceased.

Norfolk & Southern.—The authority of R. E. L. Bunch, Traffic Manager of the Atlantic & North Carolina, has been extended over the Norfolk & Southern, effective February 1.

Wabash.—J. D. McNamara, hitherto Southwestern Passenger Agent of the Chicago, Burlington & Quincy, has been appointed Assistant General Passenger Agent of the Wabash, at St. Louis.

Western Maryland.—J. T. Hendricks, who was recently appointed Freight Traffic Manager of the Western Maryland, began railroad service as a clerk in the general freight office of the Cincinnati, Hamilton & Dayton. After four years he was made soliciting freight agent in Cincinnati. He then became traveling freight agent of the Atchison, Topeka & Santa Fe, and in 1894 was appointed soliciting agent of the International & Great Northern. Three years later he was made General Freight Agent of the same road and then went to the Union Pacific, for which road he was General Agent in Philadelphia. In November, 1905, he was appointed Assistant General Freight Agent of the Western Maryland, from which office he is appointed to his present position.

Engineering and Rolling Stock Officers.

Canadian Pacific.—J. H. Boyes, Locomotive Foreman, has been appointed Superintendent of air-brakes, with headquarters at Vancouver, B. C.

Chicago & Alton.—W. D. Taylor has been appointed Chief Engineer, succeeding G. H. Kimball, resigned. Prof. Taylor is 46 years old and took the Civil Engineer's degree at the Alabama Polytechnic Institute in 1881. After doing post-graduate work at Johns Hopkins University, he was for several years Professor of Civil Engineering at the Louisiana State University. From 1889 to 1891 he was Chief Engineer on the construction of the mineral roads of the Louisville & Nashville at Birmingham and Anniston. He became Chief Engineer of the St. Louis, Peoria & Gulf in 1898, and the next year went to the Chicago & Alton, in charge of the reconstruction of the Missouri river bridge, and later was Assistant Engineer in charge of track elevation in Chicago. In 1901, he went to the University of Wisconsin as Professor of Railway Engineering, where he has remained since, having acted during that period also as engineering expert for various commissions.



W. D. Taylor.

Tidewater.—The Principal Assistant Engineers of this company are as follows: L. R. Taylor, Eastern district, with office at Norfolk, Va.; E. Gray, Jr., Middle district, with office at Roanoke, Va.; W. P. Taft, Deepwater Railway, with office at Princeton, W. Va. The following are Division Engineers: A. L. Cornell, First division, with office at Norfolk, Va.; P. B. Houston, Second division, with office at Keysville, Va.; F. A. Jones, Third division, with office at Brookneal, Va.; W. C. Knowlton, Fourth division, with office at Roanoke, Va.; W. P. Stalnaker, Fifth division, with office at Christiansburg, Va.; D. B. Dunn, Sixth division, with office at Eggleston, Va.; D. W. Crane, Seventh division, with office at Oakvale, W. Va.; A. D. Exall, Eighth division, with office at Matoaka, W. Va. Philip Aylett has been appointed Resident Engineer at Southern Branch, Va.

Purchasing Agents.

Chicago, Cincinnati & Louisville.—J. A. S. Graves, Assistant Treasurer, has been appointed General Purchasing Agent.

LOCOMOTIVE BUILDING.

The Evansville & Terre Haute is in the market for eight locomotives.

The International & Great Northern is in the market for 15 locomotives.

The Chicago & Illinois Western, it is reported, is in the market for locomotives.

The St. Louis Southwestern, it is reported, is in the market for additional locomotive equipment.

The Chicago, Rock Island & Pacific has ordered 11 locomotives from the American Locomotive Co.

The Chesapeake & Ohio has ordered one 8-wheel switching locomotive from the American Locomotive Co.

The Kansas City Southern has ordered 15 consolidation (2-8-0) locomotives from the American Locomotive Co.

The Illinois Central has ordered 40 freight and five passenger locomotives from the American Locomotive Co.

The Lehigh & Hudson River will probably purchase six or eight freight locomotives to weigh ready for service 143 tons.

The Cincinnati, New Orleans & Texas Pacific has ordered five consolidation locomotives from the American Locomotive Co.

The Pennsylvania Steel Company, Steelton, Pa., has purchased one 45-ton six-wheel switching locomotive from the East St. Louis Locomotive & Machine Shop Co.

The Grand Trunk, as reported in our issue of Jan. 19, has or-

dered 55 compound consolidation (2-8-0) locomotives and 10 simple 10-wheel (4-6-0) passenger locomotives from the Locomotive & Machine Co., of Montreal; 15 consolidation and the 10 passenger locomotives are to be completed in June, and the 40 consolidation locomotives are to be completed in November; and 10 simple 10-wheel (4-6-0) passenger locomotives from the American Locomotive Co., to be completed in August. The consolidation locomotives will weigh 200,000 lbs., with 174,000 lbs. on the drivers; cylinders, 22½ in. and 35 in. x 32 in.; diameter of drivers, 63 in.; extended wagon top boiler, with a working steam pressure of 210 lbs.; heating surface, 2,912 sq. ft.; 353 charcoal iron tubes, 2 in. in diameter and 15 ft. long; firebox, 96½ in. x 75¼ in.; grate area, 50.62 sq. ft.; tank capacity, 7,000 gallons of water, and coal capacity, 14 tons. All passenger locomotives will weigh 152,700 lbs., with 115,000 lbs. on the drivers; cylinders, 19 in. x 26 in.; diameter of drivers, 73 in.; extended wagon top boiler, with a working steam pressure of 210 lbs.; heating surface, 2,077 sq. ft.; 270 charcoal iron tubes, 2 in. in diameter and 13 ft. 6 in. long; firebox, 108½ in. x 40¼ in.; grate area, 30.5 sq. ft.; tank capacity, 6,000 gallons of water, and coal capacity, 10 tons.

CAR BUILDING.

The Great Northern has ordered 25 coaches from the Pullman Co.

The Georgia Southern & Florida, it is reported, is in the market for 400 flat cars.

The Canadian Pacific will build additional stock and flat cars in its own shops.

The Missouri, Kansas & Texas, it is reported, is in the market for 2,500 box cars.

The Chicago & Eastern Illinois will probably in the near future order some dining cars.

The Ocean Shore Railway Company (Electric) has ordered 40 passenger cars from W. L. Holman & Company, San Francisco, Cal.

The Chicago & Illinois Western will, shortly be in the market for upwards of 2,500 cars, including flat cars, coal cars, box cars and stock cars.

The Lehigh & Hudson River contemplates purchasing about 300 steel underframe coal cars, 75 steel underframe box cars and 10 low flat bottom cars.

The Western Maryland has ordered 50 Rodger ballast cars from the Rodger Ballast Car Co. These cars will be built by the American Car & Foundry Co.

The Chicago & Milwaukee Electric cars reported in our issue of Jan. 19 are to be equipped with Forsyth curtain fixtures instead of Hartshorn, as reported.

The Nevada Northern is figuring on the purchase of 10 steel ore cars of 100,000 lbs. capacity. Address the Nevada Consolidated Copper Co., San Francisco, Cal.

The Missouri, Kansas & Texas has ordered 100 Rodger ballast cars from the Rodger Ballast Car Co. These cars will be built by the American Car & Foundry Co.

The Chicago, Rock Island & Pacific Improvement Company has ordered 250 ballast cars from the Rodger Ballast Car Co. These cars will be built by the American Car & Foundry Co.

The Grand Trunk has ordered 250 standard box cars of 60,000 lbs. capacity from Rhodes, Curry & Co., to be completed May 1, and is building 10 standard baggage cars at its Montreal shops for July delivery.

The Interborough Rapid Transit Co., New York, has ordered 12 flat cars from the Pressed Steel Car Co., but denies that it is figuring on material for 10 passenger cars to be built at its own shops, as reported in our issue of Dec. 29.

The Allis-Chalmers Company is having built at the West Milwaukee shops of the Chicago, Milwaukee & St. Paul two special steel flat cars of 100 tons capacity each. These cars will measure 41 ft. long and will be fitted with 16 wheels each.

The Pennsylvania, as reported in our issue of January 19, has ordered 52 high-speed electric cars for its West Jersey and Sea Shore line, which is now being electrified. The order was distributed as follows: Eighteen cars to the J. G. Brill Co., 17 cars to the American Car & Foundry Company, and 17 cars to the Wason Manufacturing Co. The cars will be 54 ft. 8 in. long over all, and are to be delivered in the early part of July.

The Seaboard Air Line, as reported in our issue of January 19, has ordered 500 plain box cars, and 500 ventilated box cars, from the American Car & Foundry Co. These cars will be of 80,000 lbs. capacity and will weigh 38,600 lbs. each. They will be 36 ft. long x 8 ft. 6 in. wide x 7 ft. 6 in. high, all inside dimensions. The bodies

will be of wood and the underframes will be of metal. The special equipment will include pressed steel bolsters, solid I-beam, brake-beams, cast-iron brake-shoes, Westinghouse air-brakes, Dayton door fasteners, Seaboard Air Line standard doors, S. A. L. twin spring draft rigging, Symington journal boxes, Chicago roofs, and S. A. L. standard trucks. The S. A. L. has also ordered three 60-ft. café dining cars and two 65-ft. combination passenger and baggage cars, as reported in our issue of Jan. 12, from the American Car & Foundry Co. The special equipment for both includes: National-Hollow brake-beams, Westinghouse air-brakes, Janney couplers, Forsyth curtain fixtures, Pantasote curtain material, Seaboard Air Line standard door fastenings, doors, draft rigging, dust guards, paint, platforms, springs, trucks and wheels; Safety Car Heating & Lighting Co.'s heating system, Symington journal boxes, Pintsch light, and Pullman standard vestibules.

BRIDGE BUILDING.

CHICAGO, ILL.—The plans of the bridge department for improvements to be made during this year, include the building of two new movable bridges and four new stationary bridges, besides the completion of four bridges now under construction.

ENTERPRISE, IND.—The Chicago, Indianapolis & Evansville, it is said, is locating the site for building a bridge over the Ohio river at this place on its proposed road towards Owensboro, Ky.

FLORIDA.—A bill is before the Committee on Interstate and Foreign Commerce of the House of Representatives authorizing the Birmingham, Columbus & St. Andrews to build a bridge over the navigable waters of St. Andrews Bay, Florida.

GALVESTON, TEX.—The Gulf, Colorado & Santa Fe has given contracts to Kohmann & McMurtry, of Kansas City, for the substructure, and to the American Bridge Company for the superstructure of a steel bridge to consist of one 100-ft. through girder, one 215-ft. fixed span, and one 215-ft. truss draw span, to be built over the Sabine river 17 miles northeast of Kirbyville, Tex. The estimated cost of the structure will be \$110,000.

LEWISBURG, PA.—The Commissioners of Northumberland County have been directed by the County Judge to build the bridge over the Susquehanna river, between this place and Chillisquaque township. The building of this bridge has been under consideration for a long time. The work will cost about \$100,000.

MICHIGAN CITY, IND.—Bids are wanted February 6 by the Board of Commissioners for building abutments for six iron bridges in Laporte County.

MINNEAPOLIS, MINN.—This city, it is said, will build a new bridge over the Mississippi river. The plans for the structure have been approved by the War Department. It will probably take two years to complete the work.

MISSISSIPPI.—Bills have been introduced in Congress authorizing the Counties of Washington and Holmes to build a bridge over the Coldwater river, and the Counties of Yazoo and Holmes to build a bridge over the Yazoo river, both in Mississippi.

NORFOLK, VA.—The Norfolk & Western has filed plans with the Harbor Board asking permission to build two bridges over the Elizabeth river. The one over the southern branch is to be a draw-bridge with an opening of 75 ft. with two tracks, to replace the present single track structure, and the one over the eastern branch is to be a similar structure, also to have an opening of 75 ft., to replace the present structure, which has two 73-ft. openings. A special meeting will be held to consider the application. Contract for the superstructure is reported let to the Pennsylvania Steel Company, Philadelphia.

PINE BLUFF, ARK.—A commission has been appointed by County Judge, E. J. Kerwin, to arrange for building a combined highway and railroad bridge over the Arkansas river at this place. The County Court has appropriated \$20,000 for making soundings.

SMITH CENTER, KAN.—Bids are wanted March 6, by H. A. Clark, County Clerk, for building a steel bridge over the Solomon river at Cedarville, in Smith County, Kansas. J. E. Kern, Kensington, Kan., is County Commissioner.

VAN BUREN, ARK.—A bill has passed the U. S. Senate and is before the Committee on Interstate and Foreign Commerce of the House of Representatives authorizing the Fort Smith & Van Buren Bridge & Traction Co. to build a bridge over the Arkansas river at or near Van Buren, Ark. (Dec. 22, 1905, p. 200.)

WASHINGTON, D. C.—On Jan. 16 the U. S. Senate passed the bill authorizing the Memorial bridge across the Potomac river from the most convenient point in Washington to Arlington Cemetery, in Virginia. The bill limits the cost of the bridge to \$5,000,000 and appropriates \$500,000 to secure plans and commence construction work. (Dec. 15, 1905, p. 192.)

WENATCHEE, WASH.—The bill authorizing the Washington Bridge Company to build a bridge across the Columbia river, at or near Wenatchee, Wash., has been passed by both Houses of Congress. (Jan. 12, p. 12.)

Other Structures.

CHATTANOOGA, TENN.—A new passenger station is to be built in this city by the Chattanooga Station Company. Work is to be started about the first of May.

FORT ATKINSON, WIS.—Plans, it is said, are being made by the Chicago & Northwestern, to build a passenger station here to cost \$30,000.

GALVESTON, TEX.—The Galveston Wharf Company is planning to build new warehouses and sheds, at a cost of about \$100,000.

GLASSPORT, PA.—The Pittsburg & Lake Erie has given a contract to the Harris-Adams Company, of Pittsburg, for putting up a 10-story roundhouse. Additional contracts are shortly to be let for other improvements, to include new buildings costing about \$100,000.

LITTLE ROCK, ARK.—The St. Louis, Iron Mountain & Southern, it is reported, is having plans made for a passenger station here, to cost about \$200,000.

PINE BLUFF, ARK.—The St. Louis Southwestern will extend its inbound and outbound freight house at this place at a cost of \$12,000. Other improvements are to be made to cost about \$60,000 additional. The plans include the enlargement of the repair shop, and putting up an additional shed.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALABAMA GREAT SOUTHERN.—Contract is reported let by this company to W. J. Oliver & Co., of Knoxville, Tenn., for reducing the grade at different points between Chattanooga, Tenn., and Birmingham. Work is to begin at a point 23 miles south of Chattanooga, where is the heaviest grade on the line. A second track will be built between Irondale and Birmingham, a distance of seven miles, and the grade reduced.

ATCHISON, TOPEKA & SANTA FE.—The Denver, Enid & Gulf, which was recently bought by this company, is to be extended from its northern terminus at Kiowa, Kan., north through Barber County, for a distance of about 35 miles, to a connection with the existing line of the A., T. & S. F.

AUGUSTA & ELBERTON.—This company, which has projected a line from Augusta to Elberton, Ga., a distance of 60 miles, it is reported, will resume construction work, and expects to have the first 15 miles completed this spring. F. E. Verdery, of Augusta, Ga., is President.

BALTIMORE & OHIO.—To obtain connection with Roanoke and the southwestern section of Virginia this company, it is said, will build 75 miles of railroad through Shenandoah and Rockingham counties. The proposed line would parallel the Southern between Strasburg and Harrisonburg, Va. From the latter point to Lexington, 60 miles, the Southern's present line will be used, and from Lexington to Salem, 40 miles, a new line will be built. At Salem, which is within six miles of Roanoke, connection will be made with the Tidewater, now under construction, and the Norfolk & Western.

BIRMINGHAM, COLUMBUS & ST. ANDREWS BAY.—This company, it is reported, has completed grading for a distance of 45 miles, and has laid six miles of track on its proposed road from Chipley, Fla., south to St. Andrews Bay, a distance of 50 miles.

BOSTON & RHODE ISLAND (ELECTRIC).—Application has been made for a charter in Massachusetts by a company under this name, with a capital of \$1,500,000. This is said to be the same company which last year asked for a charter and was refused. The petition was made by Charles H. Blood, of Fitchburg, and others.

BURRS FERRY, BROWNE & CHESTER.—H. G. King and associates of Austin, Texas, have applied for a charter under this name to build a railroad from a point near Burrs Ferry, on the Sabine River, in Newton County, northwest through Newton, Jasper, Sabine, San Augustine and Tyler counties to a point near Peachtree Village, in Tyler County, and to a junction with the Missouri, Kansas & Texas, a distance of about 80 miles. The incorporators include: J. S. Bonner, John H. Kirby, K. H. Cawthorn and J. R. Burns, of Houston; A. C. Averill and W. Weiss, of Beaumont; J. L. Kirby, of Kountze; J. W. Link, of Orange; E. I. Kellie and James Irvine, of New York.

CALIFORNIA ROADS.—According to the newspapers F. L. Evans, a Civil Engineer of Ureka, Cal., representing an eastern railroad capitalist, is planning to build a railroad from Ureka, Cal., east into Wyoming. The proposed line runs east via Delta, Trinity

river, and along Pitt river through the Sierra Nevada mountains, touching Alturs, thence through Lakeview and Vale in Oregon, and through southern Idaho to Casper, Wyo.

CANADIAN PACIFIC.—Announcement has been made by this company that it will extend the Manitoba and Northwestern branch from the present terminus at Sheho west to Edmonton, a distance of 500 miles.

CANANEA, YAQUI RIVER & PACIFIC (SOUTHERN PACIFIC).—Work is under way on this road from Batamotal, on the Sonora line of the Southern Pacific, down the Pacific coast to Guadalajara. Track will soon be laid as far as the delta of the Yaqui river, and it is expected to have the road completed at Torin, in the Yaqui Indian country, about Feb. 1. The line will run through Alamos to Mazatlan, and from that port to Guadalajara. It will probably cross the river at Chumapaco, ten miles above Torin. The bridge to be built over the Yaqui river will take some time to complete, and will be a costly structure. Engineers of the Southern Pacific are also making the final survey for a road which is to be built through Guzman on the Mexican Central, in the State of Chihuahua, to Agua Prista, in the State of Sonora, which will connect with the Cananea, Yaqui River & Pacific. (December 15, p. 194.)

CHICAGO, INDIANAPOLIS & LOUISVILLE.—A contract is reported let by this company to the Dickerson Construction Co., of Chicago, Ill. Work is to be commenced next month, beginning at a point on the main line near Quincy, Ind., and running southwest for a distance of 50 miles, to a connection with the Illinois Central.

CHICAGO, MILWAUKEE & ST. PAUL, OF WASHINGTON.—See Pacific Railway below.

DENVER, ENID & GULF.—See Atchison, Topeka & Santa Fe above.

DETROIT TERMINAL RAILROAD.—An officer writes that the prospects of building this proposed road are first rate, and the contracts will be let during the coming spring. The proposed route is from the Detroit river at Connor's Creek to Ecorse, crossing a number of steam and suburban electric roads. Joseph H. Berry is President, and E. French, Chief Engineer, both of Detroit. (December 15, p. 193.)

GREAT NORTHERN.—This company, it is said, is planning to build an extension from Grand Forks, N. Dak., north on the east side of the Red river to Drayton, passing between Olson and Alvarado, Minn.

HARRISBURG & OHIO RIVER.—Local capitalists are organizing a company under this name, to build a railroad from Galatia, Ill., southeast via Harrisburg to a point on the Ohio river at or near Rosiclare, traversing rich coal fields in southern Illinois. F. M. Pickett is President; T. E. Bell, Vice-President; George Ledford, Secretary, and A. P. Dorris, Treasurer. Rights-of-way have been secured, and it is the intention of the company to begin construction work early this spring.

HOLLY, HOLBROOK & BIG BEND.—This company proposes to build a road from Swink, Colo., east along the Arkansas river to Holly, a distance of about 90 miles. A contract is reported let to the Holly Construction Co., of Holly, for building the first 10 miles of the proposed road. W. M. Wiley, of Holly, is interested, and W. Howe is Chief Engineer. Such a line would parallel the Atchison, Topeka & Santa Fe, which touches both these points.

IOWA TRANSFER RAILWAY.—Representatives of the Wabash, the Chicago, Burlington & Quincy, the Chicago, Rock Island & Pacific, the Chicago Great Western, the Des Moines, Iowa Falls & Northern, the Chicago, Milwaukee & St. Paul and the Des Moines Union railroads have organized a company under the above name, with a capital of \$300,000, to build a union freight yard in Des Moines. The company has bought ground in East Des Moines as a site for the yard. The directors of the new company include G. T. Ross, of the Chicago, Burlington & Quincy; Carroll Wright and C. W. Jones, of the Chicago, Rock Island & Pacific; S. C. Stickney, of the Chicago Great Western, and F. C. Hubbell and J. A. Wagner, of the Des Moines Union.

KANSAS CITY VIADUCT & TERMINAL RAILWAY.—This company is selling bonds to secure funds to carry out the work of building a viaduct between Kansas City, Mo., and Kansas City, Kan. The company has been granted a franchise to build a viaduct on a private right-of-way from Kansas City, Mo., at Bluff and Sixth streets, to Kansas City, Kan., at Fourth street and Minnesota avenue, a distance of 1 6-10 miles. The proposed structure will be of steel and concrete 60 ft. wide. Work is under way, and it is expected it will be completed in about two years.

LOUISVILLE & KNOXVILLE.—Contract has been let by this company to Edgington, Griffiths & Company, of Knoxville, Tenn., for building a cut-off from Four Mile, Ky., on the Cumberland Valley division, to Williamsburg on the Knoxville division.

MINNEAPOLIS & ST. LOUIS.—See Minnesota, Dakota & Pacific below.

MINNESOTA, DAKOTA & PACIFIC (MINNEAPOLIS & ST. LOUIS).—Incorporation has been granted a company under this name in Minnesota, to build a railroad from Watertown, S. Dak., northwest about 150 miles, and surveys are now being made. Incorporators include L. F. Day, G. W. Sweever and Frederick Wing, of Minneapolis; W. D. Morris and G. W. Case, of Watertown, S. Dak.

NEWTON & NORTHWESTERN.—This company has decided to build an extension from a point on its present line in Webster County, Iowa. Negotiations have been completed to buy the street railroad system and the power, heat and light plants of the Fort Dodge Heat, Light & Power Co., and utilize the Fort Dodge lines as an extension to be used for both freight and passenger service, steam being used as a motive power for freight. The proposed extension will be built from a connection with the existing street railroad tracks at Central avenue and Sixteenth street, Fort Dodge, south, crossing the Great Western & Illinois Central tracks on overhead bridges to the gypsum fields near the Des Moines river. After crossing the river the road will be built south to a connection with the main line of the Newton & Northwestern, near the town of Lanyon.

NORTHERN PACIFIC.—Western papers report that this company controls the North Yakima & Valley Railroad, and that it will build a short line from its main line at North Yakima, Wash., to Tacoma, reducing the curvature and grades.

OAXACA & PACIFIC, OF HARTFORD.—Incorporation has been asked for by a company under this name in Connecticut, with a capital of \$40,000,000, to build and operate railroads in the republic of Mexico. Samuel B. Howard, of Millbrook, N. Y.; A. W. Britton, of East Orange, N. J., and J. D. Baker, of Yonkers, N. Y., are incorporators.

PACIFIC RAILWAY (C., M. & ST. P., OF W.).—This company, as reported last week in the *Railroad Gazette*, has amended its articles of incorporation and changed its name to the Chicago, Milwaukee & St. Paul, of Washington. The company is to build a railroad from some point not yet determined in Seattle, and in Tacoma east and southeast, to a point on the eastern boundary of Washington approximately 300 miles.

PENNSYLVANIA.—Contracts are reported let by this company to the Drake & Stratton Co. for building the Third street branch of the Duquesne Way Elevated, at Pittsburg. The cost of the work will be about \$125,000. The work includes the building of two bridges, one over Tenth avenue and one over Third street. Other contracts reported let by this company in connection with the four-tracking of its system and straightening the lines on the middle division include the following: Masonry for the bridge to be built over the Juniata at Mount Union, and for the masonry, grading and change of the line between that place and Newton Hamilton, about three miles, to the Drake & Stratton Co.; from the latter place to Vineyard, a distance of four miles, to P. McManus, of Philadelphia; and from Vineyard to Ryde, not quite two miles, to the Thomas McNally Co., of Pittsburg; and for building a stone arch over the Juniata at Ryde, to Sparks & Evans, of Philadelphia.

PENINSULA (ELECTRIC).—Incorporated in California with a capital of \$5,000,000 to build an electric railroad from San José by way of Stanford University, Palo Alto, Redwood City and San Mateo to San Francisco, with a branch line to Los Gatos and a number of other branches, aggregating 204 miles. The directors are O. A. Hale, F. E. Chapin, G. Lyon, W. C. Andrews and A. E. Wilder. It is expected that the San José & Los Gatos Co., of which O. A. Hale is President, and also the Mt. Hamilton Exploitation Co., will be merged into the new corporation. The latter has completed two surveys to the summit of Mt. Hamilton, one by way of Evergreen and the other by way of Alum Rock. The plans of the new organization include reaching the upper portions of the valley with electric lines, with San José as a center, and roads on both sides of the southern extension of the bay, terminating at San Francisco on one side and at Oakland and Alameda on the other. It is believed that the Southern Pacific is interested in the new company.

PHILADELPHIA & READING.—A grading contract has been given by this company to Smith & Campton for work on its road from Pottstown, Pa., to Linfield, on which work is now under way. The cut at Linfield, which is one of the longest on the division, will be widened 32 ft. to accommodate two additional tracks. Grading is also under way between Topton and Alburts. Six miles of track will be laid early this spring.

ROGERS SOUTHWESTERN.—An officer writes that this company has given a contract to the W. R. Felher Construction Co., and work is under way on its proposed road, to run from Rogers, Ark., on the St. Louis & San Francisco, to a point on the Kansas City Southern, either at Gentry or Siloam Springs, Ark., about 30 miles. W. R. Felher, of Rogers, Ark., is President.

ST. LOUIS & NORTH ARKANSAS.—This road, operating a line from Seligman, Mo., where connection is made with the St. Louis & San

Francisco to Leslie, Ark., a distance of 130 miles, is planning to build an extension southeast to Bald Knob, Ark., to make a connection at that point with the St. Louis, Iron Mountain & Southern from Memphis, Tenn. An extension is also under consideration from the other end of the line.

ST. LOUIS SOUTHWESTERN.—This company, it is said, is planning to make improvements on its road during the present year at a cost of \$2,000,000. The most important include the completion of the bridge over the Red river at Shreveport, La., and building a terminal system at that place which will require eight miles of road. This work is to be finished about May 1, at a cost of about \$500,000 for the bridge and \$150,000 for the terminals. Construction work will also be carried out improving the line in Louisiana and Texas. Between Texarkana and Mt. Pleasant, the grade will be reduced and the curves eliminated. New 75-lb. rails will be laid between Noel Junction and Dallas, also between Tyler and Waco, and between Louisville and Shreveport. The improvements include the building of a number of steel bridges and concrete arches, and the widening of embankments. The drainage condition will also be improved.

SAN FRANCISCO, IDAHO & MONTANA.—A contract is reported let by this company to the Pacific Development Company, which has been formed by persons interested in this railroad, to build its proposed road from Caldwell, Idaho, to Winnemucca, Nev. (Dec. 15, p. 193.)

SOUTHERN PACIFIC.—See Cananea, Yaqui River & Pacific.

SUGAR CREEK & OHIO NORTHERN.—Incorporation, it is said, has been granted a company under this name in Ohio, with a capital of \$10,000, to build a railroad from Lorain, Ohio, to Bolivar. Incorporators include F. S. Whitcomb, C. T. Brooks and others of Massillon, Ohio.

WHEELING & LAKE ERIE.—This company, it is said, has plans completed for building a cut-off from Bolivar northwest to Orrville, Ohio, a distance of 25 miles. This will form part of the Wabash double-track line into Pittsburg, and will shorten the distance from that point to Toledo by about five miles. The Sugar Creek & Ohio Northern recently incorporated to build from Wellington, Ohio, on the Wabash, north to Loraine, will furnish the latter another outlet to a lake port.

WINDSOR, ESSEX & LAKE SHORE (ELECTRIC).—This company has completed grading between Windsor, Ont., and Kingsville on its projected road, and tracks are now being laid. The proposed route is from Windsor, Ont., via Essex, Kingsville, Leamington, Wheatley, Tilbury and Chatham, and thence to Buffalo.

RAILROAD CORPORATION NEWS.

BALTIMORE & OHIO.—The gross earnings for the six months ending December 30 were \$38,610,407, an increase of \$4,065,674, and net earnings were \$14,187,739, an increase of \$1,287,632. On the basis of these figures it is estimated that during the current fiscal year the road will earn 10.7 per cent. on its common stock, as compared with 9.07 per cent. last year.

CHICAGO & ALTON.—A meeting of the stockholders of the C. & A. Railway Company has been called for March 8, to act upon a proposition to merge that company with the Railroad Company. The Railway Company was organized in 1899 and acquired 98 per cent. of the stock of the Railroad Company, besides the property of the St. Louis, Peoria & Northern, which operates 58 miles of road. The remaining 2 per cent. of the stock, which has been held by the public, has now been acquired by the company, so that this merger is possible. The proposed move will make the C. & A. Railway 3½ per cent. bonds a direct lien on the property, instead of being secured by only a collateral mortgage. The Railway Company has \$19,542,800 common stock and \$19,544,000 non-cumulative preferred stock outstanding.

CLEVELAND & PITTSBURG.—The New York Stock Exchange has been asked to list \$2,216,500 additional special guaranteed 4 per cent. betterment stock of this company.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—The gross earnings (partly estimated), for the six months ended Dec. 31, 1905, were \$12,286,700, an increase of \$145,413, and the net earnings were \$34,247,400, a decrease of \$358,380. The gross earnings for the year (also partly estimated) ended December 31 were \$22,517,800, an increase of \$376,690, and the net earnings for the same period were \$5,659,100, a decrease of \$350,898.

DELAWARE & HUDSON.—A meeting of the stockholders has been called for February 19, to authorize the issue of \$14,000,000 4 per cent. debenture bonds. These bonds are to be issued at par to stockholders at the rate of \$1,000 for each thirty shares

of stock held. Each \$1,000 bond can be exchanged at any time within the next five years for five shares of capital stock. There is at present \$48,990,000 capital stock outstanding and \$7,000,000 more will be issued for the conversion of the new bonds. At 223, which is the present market price of D. & H. stock, the "rights" are worth about \$3.84 per share. The \$14,000,000 is to be used as follows: \$10,000,000 to pay for the United Traction Company of Albany and for a half interest in the Schenectady Railroad Company; \$2,400,000 for new equipment; and \$1,600,000 for the construction of a line around Wilkesbarre, Pa.

INTERBOROUGH RAPID TRANSIT.—The plans for the merging of the Metropolitan Street Railway with the above company have been modified; each share of Interborough stock will be exchanged for two shares of the 4½ per cent. collateral trust bonds and \$99 in common stock of the new holding company; Metropolitan Street Railway stock will be exchanged for 100 per cent. five cumulative preferred stock, and 55 per cent. common stock of the new company; and Metropolitan Securities stockholders will receive 93 per cent. in common stock of the new company. (Dec. 29, p. 208.)

The Interborough-Metropolitan Company on Wednesday filed a certificate of incorporation at Albany, N. Y., with \$5,000 preferred and \$10,000 common stock, and P. A. B. Widener, W. G. Oakman, James Jourdan, M. F. Plant and J. B. McDonald, directors. An announcement from the office of August Belmont & Co. is as follows: "This is the first move officially taken in the consolidation of the great traction companies. In many respects it may be considered preliminary. It fixes, however, the name of the new corporation, the names of its incorporators and the objects sought to be attained by the merger."

KANSAS CITY VIADUCT & TERMINAL COMPANY.—A syndicate headed by Fisk & Robinson, of New York, has contracted to purchase \$2,600,000, first mortgage 4½ per cent. bonds of this company, which is building an elevated road from Kansas City, Mo., to Kansas City, Kan. This is part of an authorized issue of \$3,500,000 of which \$1,548,000 is outstanding, \$1,052,000 to be issued from time to time and \$900,000 reserved for future requirements.

LACKAWANNA & WYOMING VALLEY.—According to a newspaper report, the Lackawanna & Wyoming Valley Rapid Transit Company, controlled by the Westinghouse Electric & Manufacturing Company, and itself controlling the Lackawanna & Wyoming Valley Railroad, has been sold. The Lackawanna & Wyoming Valley Railroad is a standard gage, third rail electric line, from Scranton, Pa., to Wilkes-Barre, 20 miles, with a branch from Scranton to Dunmore.

MISSOURI, KANSAS & TEXAS.—A meeting of the stockholders has been called for March 3 to authorize an issue of \$20,000,000 general mortgage 4½ per cent. sinking fund bonds of 1936. Speyer & Co., New York, have underwritten the \$10,000,000 which is to be issued; the remainder is reserved. The \$10,000,000 already underwritten is to be offered to stockholders at 87½ and accrued interest to the extent of 13 per cent. of their holdings.

NORTHERN PACIFIC.—It is reported that this company has bought the Astoria & Columbia River for \$4,000,000. The A. & C. R. operates 81 miles of road between Goble, Ore., and Seaside, and has \$1,619,000 capital stock and \$3,280,000 4 per cent. bonds of 1996 outstanding.

PERE MARQUETTE.—The gross earnings, for the eight months ended August 30, were \$9,012,352, and the net earnings \$2,409,797. The total income was \$2,569,458, and it is estimated that the net earnings for the twelve months will be \$3,854,187, which will mean a deficit of \$757,528.

PITTSBURG & LAKE ERIE.—The gross earnings for the year ended December 31, 1905, were \$12,837,735, an increase of \$2,802,226, and the net earnings were \$2,950,111, an increase of \$636,244. These figures show that the gross earnings were at the rate of \$67,500 per mile.

TOLEDO & OHIO CENTRAL.—Potter, Choate & Prentice, New York, are offering at par \$448,000 4½ per cent. equipment notes of this company. These notes mature in blocks of \$32,000, semi-annually July 1, 1906 to 1913, and are secured by 500 steel cars costing \$557,150, of which 20 per cent. was paid in cash and the rest by the above notes.

UNION PACIFIC.—There is now outstanding \$190,145,900 common stock and \$5,884,000 convertible bonds.

VANDALIA.—Speyer & Company, of New York, have bought \$3,000,000 Vandalia consolidated 4 per cent. bonds of 1955. This is part of the \$25,000,000 authorized, and completes the first \$10,000,000 known as series A of that issue. The \$3,000,000 will be used to retire the \$600,000 second mortgage 5 per cent. bonds of the Terre Haute & Indianapolis, maturing Jan. 1, 1906, and for various improvements.

